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Cultivation and Typing of Tubercle Bacilli.—The bacilli are cultured from suspected material on Loewenstein's medium and the liquid medium of Besredka, and in urine tests guinea pigs are also inoculated. Typical "eugonic" strains of human bacilli were recovered in Loewenstein cultures alone. When types cannot be differentiated on Loewenstein's and Besredka's media, the strains are homogenized for 20 minutes with 4 per cent sodium hydroxide and are then planted on Loewenstein's medium and so far as these secondary cultures are available they are designated as "eugonic." The "dysgonic" strains are tested for rabbit pathogenicity, and those not typically bovine are designated as "weakened bovine" or so-called "dysgonic" human, and are inoculated into guinea pigs. Among 111 strains there were no atypical cultures. Avian types played no appreciable rôle as a cause of typical human tuberculosis in Denmark. On the contrary, bovine bacilli were found in the majority of cases of tuberculous cervical adenitis up to 80 per cent in children under 15 years, in renal tuberculosis in about 20 per cent, and in tuberculous meningitis in about 25 per cent (in children under 5 years above 50 per cent). The human type was found in the majority of the cases of pulmonary or surgical tuberculosis (excepting cervical and renal tuberculosis).—*Reinzüchtung und Typenbestimmung von Tuberkelbacillenstämmen. Eine Vereinfachung der Methoden für die Praxis, K. A. Jensen, Zentralbl. Bakt., I. Orig., 1932, cxxv, 222.*—*(H. J. C.)*

Differentiation of Tubercle Bacilli by Culturing.—The author believes that a type differentiation of tubercle bacilli is possible on Petragnani's medium, corresponding with the views of Wolters and Dehmel (*Zentralbl. Bakt., I. Orig., 1930, 117, 279 & 412*), especially under certain conditions: for instance, when for the purpose of differentiation the initial growth and first subcultures are used; when cultures are made without complete exclusion of air; when caution is observed during culture to maintain a certain condensation water-content. Growth on glycerol-agar proved a valuable elaboration of the culture differentiation. In the majority of cases the type determination agreed in animal- and culture-tests. Exceptions were noted in 4 cases from dogs, 2 from cats, 2 from monkeys, and one from a lion, in which typical human growths occurred, with more or less marked pathogenicity for rabbits. It is believed that the culture method of type differentiation is of definite value.—*Beitrag zur Frage der Typendifferenzierung der Tuberkelbakterien auf Nährböden, Ruth Pallaske-Eber, Ztschr. f. Tuberk., 1933, lxviii, 42.*—*(H. J. C.)*

Transfers of Cultures to Liquid Media.—A platinum loop is moistened with a small amount of vaseline-oil and the culture mass is then obtained with this loop and transferred to a liquid medium. The oil prevents the mass from sinking. Transplants can likewise be made from liquid to liquid media; and pieces of organs, after immersion in a small amount of the oil on a water crystal, can also be planted on liquid media. Good growth occurred in 8 to 16 days on the surface of bouillon. No harmful effects of the oil were noted.—*Ein Neues Verfahren zur Tuberkelbacillenzüchtung auf flüssigen Nährböden, Phillip Spanier and Emilie Tschertkowa, Zentralbl. Bakt., I. Orig., 1932, cxxv, 361.*—(*H. J. C.*)

Protective Function of Fatty Capsule of Tubercle Bacillus.—It is well known that *Mycobacterium tuberculosis* is more highly resistant to physical and chemical agents than are most of the non-spore-forming bacteria. While the cause of this variation in resistance is not well understood, it appears to be quite generally assumed that the superior resistance of the Mycobacterium group is related to the high percentage of fatty or waxy compounds contained in the bacilli. It would be interesting and perhaps valuable to know whether these fatty bodies are related to the superior resistance of the tubercle bacillus. Experiments were planned to solve this problem if possible. *Mycobacterium tuberculosis*, H520, apathogenic, was grown upon a medium containing 5 per cent glycerol and on the same medium without glycerol. On the glycerol medium it developed approximately 24 to 32 per cent lipins; on the medium without glycerol it developed about 5 to 9 per cent of lipins. When the fat and lean bacilli were exposed to chemical and physical agents (phenol, corrosive sublimate, gentian-violet, acid fuchsin, alcohol, sodium chloride, heat and mercury-arc rays) more than half of the trials showed no difference in resistance between the two cultures. When a difference was shown, the resistance was slightly greater in the case of the fat bacilli. The slightly greater resistance shown by the fat bacilli may be due to their growth on a more favorable medium, containing 5 per cent glycerol. The results do not give a final answer to the question raised, but they tend to show that the so called fatty capsule does not materially increase the resistance of the bacilli to chemical and physical agents.—*Biology of the Tubercle Bacillus. Does the So-Called Fatty Capsule Serve to Protect the Tubercle Bacillus? J. Weinzirl, J. Bact., May, 1933, xxv, 447.*—(*F. G. P.*)

Metabolism of Tubercle Bacilli.—Certain metabolic factors of growing tubercle bacilli were determined on a synthetic medium. It was found that the bacilli break down glycerol and glucose, and that they do not form any protein split-products during their growth. The latter are formed only after all assimilable nitrogen has been used. The hydrogen-ion concentration is changed in a characteristic way by tubercle and by paratubercle bacilli. Tubercle bacilli can grow under anaërobic conditions.—*Beiträge zur Kenntnis des Tuberkelbacillenstoffwechsels, L. M. Model, J. P. Gurjeff and A. M. Pirogoff, Beitr. z. Klin. d. Tuberk., March, 1933, lxxxii, 474.*—(*M. P.*)

Virulence of Tubercle Bacilli.—Guinea pigs were inoculated with measured numbers of tubercle bacilli contained in the sputum of patients with pulmonary tuberculosis. The counting of the bacilli was complemented by cultures, so as to establish the number of viable bacilli. These strains from seven different patients showed marked variation in virulence as tested on guinea pigs.—*Virulenzversuche mit dem Tuberkuloseerreger, E. Butschowitz, Beitr. z. Klin. d. Tuberk., January, 1933, lxxxii, 66.*—(*M. P.*)

Action of Enzymes on Tubercle Bacillus.—The literature contains confusing statements as to the effects of digestive enzymes on living or dead tubercle bacilli. Some investigators state that the tubercle bacillus resists digestion; others find that it is killed. In the present study an attempt was made to determine the extent to which tubercle bacilli are digested by pancreatic enzymes. Twelve human and 4 bovine strains were used. The enzyme preparations used were *Holadin* (consisting of amylase, lipase, trypsin and esterase), Trypsin, Pancreatin and Taka-diastase. The results show that tubercle bacilli undergoing autolysis *in vitro* liberated soluble digestion-products. Among these were acids and reducing substances. Tubercle bacilli undergoing pancreatic plus autolytic digestion *in vitro* liberated greater quantities of acids and reducing substances than by autolysis alone. The swelling of tubercle bacilli in suspensions containing pancreatic enzymes gave additional proof that digestion took place. Autolytic enzymes alone brought one-fourth of the weight of tubercle bacilli into solution in four days, and one-third in nine days. These proportions were only slightly increased by added pancreatic enzymes.—*Effects of Pancreatic Enzymes on the Tubercle Bacillus, W. N. Berg, J. Bact., November, 1932, xxiv, 341.*—(*F. G. P.*)

Single-Cell Dissociation of Acid-Fast Bacilli.—It was considered probable that if dissociation was to be regarded as a part of the cyclic phenomenon, a culture from a single bacterial cell from a known *R* colony form should under certain circumstances give rise to some colony offspring of an *S* character, while the reverse should be the case with single organisms from initially *S* cultures. Experiments were designed to determine whether such was the case. The cultures of avian tubercle bacilli were dissociated originally on plates of Petroff's egg medium and also on the medium of Proskauer and Beck. The typical rough or smooth colony was lifted from the plate and transferred to a suitable culture medium. Single organisms were then isolated with the Chambers micromanipulator. In these studies it was found necessary to develop the method, so that the microdroplets containing single organisms of this slow-growing species could be preserved for a long time in order that periodical observations on change in morphology could be made on identical individuals for several days or weeks. With this method a slow-growing single cell may be allowed to develop to colony maturity in the microdroplet before it is transferred to the culture-tube, so that a much larger percentage of successful "takes" is procured than would be the case were the single organism planted in or on a suitable medium. The results of this study show that the culture offspring of a single mycobacterium of the *R* or *S* avian tubercle bacillus or the *R* or *S* bacillus of "rat leprosy" will under certain conditions give rise to individuals capable of mutation. In other words, the potentiality of dissociation is an inherent property of the single cell of each of these two species, regardless as to whether they are in the *S* or *R* phase of their mutation cycle. The *R* to *S* mutation of a single-cell *R* culture of avian tubercle bacilli has been induced by the following: (1) animal passage; (2) rapid transfers in glycerol-broth containing normal inactivated rabbit-serum; (3) Aging the culture in the incubator. The *S* to *R* mutation of a single-cell *S* strain of avian tubercle bacilli has been induced by the following: (1) animal passage and (2) rapid transfers on the solid medium of Proskauer and Beck.—*Single Cell Dissociation of Acid-Fast Bacteria; Mycobacterium of Avian Tuberculosis; Mycobacterium of "Rat Leprosy," M. C. Kahn and H. Schwarzkopf, J. Bact., February, 1933, xxv, 157.*—(*F. G. P.*)

Tests with Virulent Tubercle Bacilli and *BCG*.—The author studied the agglutinability of tuberculous sera with suspensions of human tubercle bacilli and *BCG*. In addition, the strains were tested against Mulford's immune horse-serum prepared with human tubercle bacilli. The Mulford serum was also titrated against the carbohydrate (polysaccharide) and protein fractions of the tubercle bacillus. The chemical investigations consisted of weighing the fat, protein and polysaccharide fractions. The protein and sugar fractions were tested by the various protein and sugar reactions. Fats and proteins were less and carbohydrates greater in *BCG* than in human tubercle bacilli. The water-soluble fraction, after neutralization, was tested for optical rotation, being stronger for *BCG*, and, after hydrolysis with 5 per cent sulphuric acid, the *BCG* carbohydrates gave a strong Orcin reaction (for presence of pentose) while this reaction was only weak for the same fraction of tubercle bacilli. Agglutination with tuberculous sera and immune horse-serum occurred in higher dilutions of human tubercle bacilli than of *BCG*, and chemical analysis revealed decided differences between the two strains in that fats and proteins were more abundant in human tubercle bacilli and carbohydrates were greater in *BCG*. The intensity of the agglutination reaction with proteins of tubercle bacilli was greater for tubercle bacilli, while with the polysaccharides it was greater for *BCG*. The greater intensity of the agglutination reaction with virulent human tubercle bacilli was thought to be dependent upon the greater content of their fats and proteins.—*Vergleichende serologische und chemische Versuche mit virulenten Tuberkelbazillen und mit BCG-Bazillen, Marie Maxim, Ztschr. f. Tuberk., 1933, lxvi, 450.*—(*H. J. C.*)

Bacillaemia in Rabbits as Shown by Loewenstein's Method.—The low incidence of 3.5 per cent positive cultures by Loewenstein's method in 193 cases has led to studies in artificially infected animals. In rabbits, given 8 mgm. bovine bacilli intravenously, specimens of 5 cc. of heart-blood were examined and yielded 2 positives and 3 negatives. Other rabbits, given 17 mgm. of human or bovine bacilli, disclosed a bacillaemia upon guinea-pig inoculation and by cultures, while with 2 mgm. this was not so. However, with progression of the disease in the animals, the amount of growth diminished. From this it is concluded that there are present in the blood unfavorable influences which inhibit the development of the bacilli. The more marked and the longer the tuberculous changes exist in the body the less are the chances for obtaining positive blood-cultures. It is believed that the "normal active vitality" of the strain is probably more important for the development of bacillaemia than the quantity of bacilli.—*Untersuchun-*

gen über Bazillamie an Kaninchen (nach der Loewensteinschen Methode), L. Shapiro, Ztschr. F. Tuberk., 1932, lxvi, 248.—(H. J. C.)

Tuberculin Testing.—The object of this investigation was a study of the variations in "tuberculin sensitivity," manifested by adults free from clinically recognized tuberculosis, and a comparison of the findings in nontuberculous with those in clinically tuberculous groups. The tuberculous patients were more sensitive both in regard to "end-point" reactivity with serial dilutions and to the intensity of reaction as evaluated through measurement of the size of the reaction area. In the nontuberculous groups the females showed a more marked reactivity than the males, but both the males and the females of the European race showed less reactivity than that recorded for South African native mine recruits. It would appear that pronounced cutaneous tuberculin sensitivity in a group is associated with liability to severe tuberculosis. In the actively tuberculous groups the reactivity of the male appears to be greater than that of the female. However, this may be explained by the tendency to a severe and rapid progression of the disease in Welsh females. The "anergic" state in tuberculous persons is associated, not only with loss of tuberculin reactivity, but with marked increase in the rate of sedimentation of red blood corpuscles.—*The Intradermal Tuberculin Test in Nontuberculous Adults, S. L. Cummings and A. C. Evans, Brit. M. J., May 13, 1933, no. 3775, 815.—(T. O. R.)*

Dialyzed Tuberculin.—The culture filtrate of a Sauton culture of tubercle bacilli was dialyzed against distilled water for twelve days. This tuberculin showed a 90 per cent reduction of its lethal dose for tuberculous guinea pigs, but the substance which produced the skin reaction in tuberculous animals was reduced only 20 per cent as compared with the original filtrate. This tuberculin was used for intracutaneous injections on human beings. Children, clinically free of tuberculosis and with negative tuberculin reactions, showed repeatedly small reactions to this tuberculin. Tuberculin-positive individuals show stronger reactions to the dialyzed tuberculin, while clinically, tuberculous children react less to this preparation than to old tuberculin.—*Über die intracutane Wirkung eines gereinigten Tuberkulins mit überwiegendem Gehalt an "Hautstoff", E. Küster and W. Pockels, Beitr. z. Klin. d. Tuberk., February, 1933, lxxxii, 237.—(M. P.)*

Size of Tuberculin Reactions.—The surface-area of the reaction to 0.1 mgm. of tuberculin, given intracutaneously, was studied in 60 children, in whom childhood tuberculosis in the late or healing stage was present. Measurements, taken at intervals of 3 to 168 hours, demonstrate that the rapidity of the appearance and development of the reaction, as well as its tendency to persist, is directly related to the degree of allergy. Reactions may attain an appreciable size as early as 3 hours following the test. Great variations between the size of the reaction in different children occur, the lowest coefficient of variation (56.7 per cent) occurring at 48 hours. Studies at the Lymanhurst School suggest that the development of allergy to tuberculin in children is harmful rather than beneficial as regards the course of subsequent tuberculous infection.—*Cutaneous Reaction to Tuberculin in Primary Pulmonary Tuberculosis: Growth and Variability of Surface Area, C. A. Stewart, Am. J. Dis. Child., June, 1933, xlv, 1229.—(M. D.)*

Tuberculin and Red-Cell Sedimentation.—The injection of Old Tuberculin, because it is followed by inflammation in the diseased organs, might be expected to cause an increase in the sedimentation rate of the red blood cells of tuberculous animals. To test this hypothesis rabbits were infected with human and bovine bacilli and the red blood cell sedimentation rate determined before and after the intravenous or subcutaneous injection of 0.5 cc. of O. T. The sinking velocity of the red blood cells was found to be considerably increased by the tuberculin. This effect is specific, for concentrated glycerine-bouillon had no such effect on tuberculous rabbits, nor did O. T. injected into normal rabbits increase the sedimentation rate. Two out of 6 nontuberculous rabbits with snuffles reacted to the injection of O. T. with a moderate increase in sedimentation rate. The effect of the tuberculin may be attributed to the inflammatory reaction it causes. The possibility cannot be excluded, however, that some antigenic substances in O. T., acting specifically in tuberculous rabbits without causing inflammation, may cause the increased sedimentation rate.—*The Sedimentation Rate of Red Blood Cells of Tuberculous Rabbits Injected with Tuberculin, J. Freund and D. E. Frank, J. Immunol., March, 1933, xxiv, 247.—(J. S. W.)*

Autogenous Antibodies in Tuberculosis.—The author found that a certain number of tuberculous sera gave a positive complement-fixation reaction with alcoholic lung extracts. It could not be determined

with certitude whether the reaction was due to the presence of lung lipoid antibodies in the tuberculous serum or whether it depended on serum lability. To determine this, further studies are essential. The ability of certain tuberculous sera to react with alcoholic heart extracts is, in all probability, due to serum lability.—*Zur Frage der Autoantikörperbildung bei Tuberkulose, O. Fischer, Ztschr. f. Tuberk., 1933, lxviii, 50.*—(*H. J. C.*)

Antigenic Substances in Urine in Tuberculosis and Syphilis.—It is a well-established fact that in many infectious diseases enormous numbers of the exciting microbes are sometimes excreted with the urine without demonstrable damage to the kidneys. In virus diseases also, transmission by the urine can undoubtedly take place, and confer protection against the virus. Furthermore the Aschheim-Zondek test proves that fully-active hormones are excreted by the urinary tract and, finally, the presence in the urine of a substance which is characteristic for blood-group A has been demonstrated by Brahn, Schiff and others, who have shown that concentrated urine can be used for serological reactions, which are specific for the blood-group. On the basis of these observations, it can be assumed that in infectious diseases specific substances with antigenic properties are excreted by the urinary tract. In both tuberculosis and syphilis lipoids or the alcohol-soluble fraction of the exciting agent was found to be the best antigen for complement-fixation. Since the alcoholic extract always contains part of the urea which interferes with the reaction, adsorption by charcoal was resorted to. In order to eliminate traces of fat or lipoids which the normal urine contains, the charcoal was first treated with acetone. The alcoholic extract, condensed to half its volume, was used as antigen in the usual complement-fixation test. The results were positive in more than 50 per cent of cases with moderately or far advanced tuberculosis. The test may be of value for the early diagnosis of genitourinary tuberculosis or of acute exacerbations which cannot be recognized by other methods.—*Ueber die Ausscheidung von Antigenen mit dem Harn bei Infektions-krankheiten, insbesonders bei Tuberkulose und Syphilis, F. Klopstock, Klin. Wchnschr., February 18, 1933, xli, 249.*—(*K. F.*)

Vaccines from Bacilli Isolated at Lübeck.—A number of animal experiments are reported with vaccines used in Lübeck and with strains isolated from diseased children. These experiments would indicate that the vaccines contained an inconstant mixture of *BCG* and virulent human bacilli.—*Weitere Untersuchungen zur Frage nach der Beschaffenhait der Lübecker Impfstoffe, O. Kirchner, Beitr. z. Klin. d. Tuberk., March, 1933, lxxxii, 265.*—(*M. P.*)

Tuberculin Reaction in Tissue Cultures.—The nature of the mechanism underlying the tuberculin reaction has never been satisfactorily explained. The presence of an antibody that reacts to tuberculin with the production of a specific toxic substance has not been conclusively demonstrated. The phenomenon known as anaphylaxis is now believed to be due to the liberation of histamine by the interaction of antigen and antibody. The cells from a tuberculous animal react to tuberculin differently from the way the cells of an animal sensitized to a foreign protein react when brought into contact with that protein. In the present study an attempt is made to differentiate between the tuberculin and other allergic reactions by tissue-culture methods. Guinea pigs were injected with a virulent strain of bovine tubercle bacilli and were killed when they gave a well-marked reaction to 10 mgm. of Old Tuberculin injected into the skin. Explants from the bone-marrow and spleen were transferred to plasma obtained from the tuberculous guinea pigs, in plasma from normal guinea pigs and in plasma from guinea pigs sensitized to horse-serum. Old Tuberculin, in dilutions of from 1:3 to 1:3000, was added, and the cultures were observed after incubation for four, twenty-four and forty-eight hours. The addition of tuberculin in concentrations up to 1:60 in most instances caused complete inhibition of migration and growth. Control experiments, in which various dilutions of horse-serum, Locke's solution and concentrated glycerol-broth were substituted for the tuberculin, showed no inhibition of growth. One series of guinea pigs was sensitized by a single injection of horse-serum (anaphylaxis) and a second series was given 4 or 5 subcutaneous injections of horse-serum (Arthus phenomenon). The guinea pigs were bled to death and explants were prepared from the spleen and bone-marrow; one series was made in plasma from the sensitized animal and a second series in plasma from normal guinea pigs. Sterile horse-serum was then added in dilutions from 1:3 to 1:3000. At the end of twenty-four hours all explants showed growth or migration. The results were the same, whether the tissue was grown in serum from sensitized or from nonsensitized animals. No difference could be detected in the growth or character of the cells of the sensitized animals to which horse-serum was added, nor in the control explants to which horse-serum was not added, nor in

the control explants from nonsensitized guinea pigs to which horse-serum was added. A fine precipitate was found in those explants that contained plasma from the sensitized animals, after the addition of horse-serum. Guinea pigs, infected with tubercle bacilli, were rendered sensitive to horse-serum by injections of the serum either with the tubercle bacilli, or one week later. A second series of tuberculous guinea pigs was given 4 or 5 injections of horse-serum. When the sensitivity of these animals to both tuberculin and horse-serum was demonstrable, they were bled to death and explants of the spleen and bone-marrow were prepared in plasma from sensitized and from nonsensitized guinea pigs. To one series of explants various dilutions of tuberculin were added, and to the other series various dilutions of horse-serum. Migration and growth were not inhibited by the addition of horse-serum, but were inhibited by tuberculin as in the previous experiment. These experiments suggest that the mechanism underlying the tuberculin reaction is different from the mechanism of anaphylaxis and the Arthus phenomenon.—*Tissue Culture Studies on the Relation of the Tuberculin Reaction to Anaphylaxis and the Arthus Phenomenon, J. D. Aronson, J. Immunol., July, 1933, xxv, 1.—(J. S. W.)*

Immunization Phenomena in Vaccinated Rabbits.—To study the development of bacteriotropic substances (immune opsonins), rabbits were vaccinated by repeated intracutaneous injections of heat-killed bovine tubercle bacilli and the influence of their sera on the phagocytosis of tubercle bacilli by polymorphonuclear and mononuclear leucocytes observed. The polymorphonuclear leucocytes used in the experiments were obtained from the buffy coat of normal rabbit blood. The mononuclear leucocytes were obtained by injecting light paraffine intraperitoneally into a rabbit and later washing out the peritoneal cavity with citrated physiological salt solution. The fluid thus obtained was centrifugated and the cells carefully washed to prevent injury. Suspensions of living microörganisms of the same strain of bovine tubercle bacilli used, when heat-killed, to vaccinate the animals were employed to test the power of their sera to promote phagocytosis. All the animals were bled each week from an ear-vein and serial dilutions (up to 2,000) made. Equal parts (0.05 cc.) of diluted serum, leucocytes, and bacterial emulsion were mixed and incubated in a water-bath at 37°C. for fifteen minutes and cover-slip preparations made. Normal rabbit-serum was used as a control for the two lowest dilutions. When mononuclear leucocytes were used, a a small drop of normal serum was added to each vial to make these cells adhere to the cover-slips. After air-drying, the cover-slip preparations were fixed with methyl alcohol, stained with hot carbol-fuchsin, decolorized with 3 per cent acid-alcohol and counter-stained with methylene-blue. After mounting on slides, 100 polymorphonuclear and mononuclear cells were counted, respectively, to determine the degree of phagocytosis with each dilution of serum. The bacteriotropic strength of the serum was measured by the highest dilution with which the percentage of leucocytes containing tubercle bacilli exceeded that with normal serum alone. The immune serum was obtained from 7 rabbits vaccinated by repeated intracutaneous injections of 0.4 mgm. of heat-killed bovine tubercle bacilli (Ravenel). These organisms were killed by heating in the Arnold sterilizer at a temperature of 100°C. for one hour. The inoculations were given usually at intervals of two to three days until 16 had been given. Results were charted in the form of graphs. The ability of the sera of the entire group of vaccinated animals to promote phagocytosis did not begin to become evident until three weeks after the beginning of observations. Nine injections of heat-killed bacilli had been made by that time. The maximum titre was reached in from twenty-five to thirty days, and usually ranged from 1 to 1,000 to 1 to 2,000 dilution. In every instance the phagocytic activity of the mononuclear leucocytes was equal to that of the polymorphonuclears and in several instances it was greater. Five of the 7 rabbits developed cutaneous hypersensitiviness. This occurred somewhat later than the earliest increase in phagocytosis. For comparison, the development of bacteriotropic substances was observed during the active immunization of 2 rabbits infected with living virulent bovine tubercle bacilli given into the ear-vein. In these rabbits there was a more prompt response in the production of bacteriotropins than in the vaccinated rabbits but the titres did not exceed those ultimately reached by the vaccinated animals. The period of observation for these experiments was thirty-five days. The close parallel between the bacteriotropic action of the serum with polymorphonuclear leucocytes and with mononuclear leucocytes indicates that the same antibody is concerned in promoting the phagocytosis of tubercle bacilli by these different cells. Because of the relation of mononuclear leucocytes to tuberculosis, this fact may be of significance.—*Immunization Phenomena in Rabbits Vaccinated with Heat-Killed Tubercle Bacilli. A Study of the Cutaneous Reactions and the Development*

of Bacteriotropin, J. Hughes, J. Immunol., July, 1933, xxv, 103.—(J. S. W.)

Active Immunization in Experimental Tuberculosis.—In comparing the immunizing effects of various methods of vaccination, the positive skin reaction to tuberculin is considered the most dependable indicator of acquired immunity. Two groups of guinea pigs were treated with *BCG* and with Schroeder's thymus-vaccine respectively. The latter is obtained from cultures of virulent strains on a medium containing thymus extract. These subcultures lose their virulence and pathogenic properties after several weeks. In animal experiments an increased resistance to reinfection following vaccination with thymus cultures has been observed by various investigators. In the *BCG* group 18 animals were infected subcutaneously with doses ranging from 0.3 to 10 mgm., and became without exception allergic to tuberculin within six weeks. In this series 13 were then reinfected with 0.000,1 mgm. of a strain of known and constant virulence. Five of the reinfected animals died after an average of 165 days, and showed generalized tuberculosis of lungs, liver and spleen. None of the 17 animals in the second group that were treated with thymus vaccine showed a marked tuberculin reaction after six weeks. Of the 15 guinea pigs that were reinfected 11 died after an average of 119 days. Of the 26 animals of the control group 24 died with an average of 142 days. The impression is gained that the course of tuberculosis is more benign in the animals that were previously treated, as indicated by the ratio of living animals, which was 61 per cent in the *BCG* group, and 26 per cent in the thymus-vaccine series, against 7.5 per cent in the controls. *BCG* vaccination confers a higher degree of immunity than thymus-vaccine and the latter is not followed by positive tuberculin reactions.—*Ueber die Immunitäts-wirkung verschiedener Tuberkulose-Schutzimpfungen, K. Rupilius, Wien. klin. Wchnschr., November 11, 1932, xlv, 1412.—(K. F.)*

Allergic Inflammation and Tuberculous Infection.—In order to determine the part which the allergic local reaction plays in the defense against reinfecting bacilli the inflammation caused by injections of chemospecific haptenes was studied. This inflammation is characterized by a slow development and reaches its height after forty-eight hours, whereas the local reaction to foreign proteins sets in promptly. Atoxyl diazotate was used in 1 per cent solution, of which 1 cc. was injected three times at three-day intervals. After from 25 to 35 days an anaphylactic local reaction can thus be obtained. On the twenty-fifth day the sensitized animals received at the site of the local reaction an intracutaneous injection of 0.02 mgm. human tubercle bacilli and simultaneously 0.1 cc. of the atoxyl solution. On the other side, the same amount of atoxyl without bacilli was given. An equal number of nonsensitized guinea pigs was similarly treated. In another series smaller infecting doses were used and in a control group tubercle bacilli alone were injected. The histological examination of the lesion caused in sensitized animals by the injection of tubercle bacilli revealed a marked formation of scabs and numerous abscesses, both of which contained a great number of bacilli. Compared with nonsensitized animals all the changes appeared to be accelerated and accentuated. There was no difference on the length of life in both groups, so that the course of the infection did not seem to be altered by the increased allergic reaction. In another experiment tubercle bacilli were injected in sensitized animals when the allergic inflammation was fully developed. The local reaction was not affected by the injection of tubercle bacilli, and subsided within a few days. After three to four weeks tuberculous ulcers appeared at the site of the vaccination which in most animals persisted until death. The authors conclude that in Koch's experiment the local allergic reaction plays no rôle in the defense against reinfection and that the specific sensitization of all tissue cells confers protection against reinfecting bacilli.—*Zum Problem der Beziehungen zwischen allergischer Ent-zündung und tuberkulöser Infektion.—A. Klopstock, W. Pagel and A. Guggenheim, Klin. Wchnschr., October 29, 1932, xl, 1826.—(K. F.)*

Cutaneous Epithelium in Immunity Responses.—The location of the specific response to antigens has been generally assumed to be in the connective or reticular tissue. Recently, however, the study of drug idiosyncrasies, especially of certain types of allergic dermatitis, suggests that under appropriate conditions the ectodermal tissue is also capable of specific immune response. In man and in the guinea pig these types are regularly of eczematoid character in contrast to the transient urticarial wheal. The majority of cases of human eczema are the result of a similar sensitization. The involvement of the epidermis in the reaction is characteristic of eczema and serves to differentiate it from simple inflammatory reactions. In allergic dermatitis the localization of all demonstrable hypersensitiveness is exclusively in the skin. The intravenous administration of an extract of poison-ivy to a

sensitive individual does not cause general symptoms, but will, in sufficiently large doses, produce skin lesions. Even the intracutaneous injection is without effect. This strict localization of the sensitiveness to the skin together with the development of pathological lesions in the epidermis leaves no doubt that the epidermis itself must be hypersensitive. Sensitization of the epithelium probably occurs, not only in drug idiosyncrasies, but also in the tuberculin type of hypersensitiveness, that type which is especially connected with certain infectious diseases. In the observation of a great number of tuberculin reactions in animals it was noted that there was no direct connection between necrosis in skin reactions and the degree of general hypersensitiveness. The sensitization which results in the strong necrotic skin reactions is in a large measure independent of the development of the hypersensitiveness of the cutis or of systemic hypersensitiveness. In tuberculin skin reactions the necrosis may be apparent only in the epithelium. The epithelium and the tissue immediately beneath it will in these cases be densely infiltrated with polymorphonuclear leucocytes. These cells will also be more or less present in the deeper layers of the cutis but here no definite sign of necrosis is noted. Another characteristic of the cutaneous tuberculin test which indicates the direct reaction of the epithelium is the early involvement of the tissue, as indicated by microscopical studies. The hypothesis presents itself that the reagins mediating the clinical cases of hypersensitiveness under discussion are produced by the epithelial tissue of the skin or the mucous membranes, and their special characteristics are due to this fact.—*The Participation of Cutaneous Epithelium in Immunity Response, L. Dienes, J. Immunol., March 1933, xxiv, 253.*—(*J. S. W.*)

Epidermal Sensitization by *Ektebin*.—The epidermal tuberculin reaction, which is positive only in tuberculous lesions of the skin and negative even in the presence of active tuberculosis of other organs, is considered a strictly specific test. In the present study the question is raised of whether or not it is possible to produce artificially epithelial sensitiveness to tuberculin. Moro's *Ektebin* was used for inunctions on the intact skin. It is a lanolin ointment, which contains a concentrated tuberculin and numerous dead tubercle bacilli which are still acid- and alcohol-fast. The inunction causes the formation of small nodules which clinically and histologically resemble tuberculides and contain numerous tubercle bacilli, which are later disintegrated. According to Moro, the application of *Ektebin* on the skin stimulates the production of antibodies and increases immunity. A group of 16 patients, who had positive intracutaneous reactions but did not react to repeated epidermal tests, were treated with *Ektebin*. Ten days after the *Ektebin* reaction, which was positive in the majority of cases, the epidermal test was repeated and was now found positive in 9 instances. It seems that the *Ektebin* reaction with the formation of nodules that are structurally tuberculides causes epithelial hypersensitiveness which is similar to that observed in tuberculosis of the skin.—*Experimentelle Erzeugung epidermaler Tuberkulinempfindlichkeit mittels Ektebin, E. Nathan and P. Kallos, Klin. Wchschr., November 12, 1932, xl, 1909.*—(*K. F.*)

Percutaneous Immunization Experiments in Guinea Pigs.—The author attempted to immunize guinea pigs against tuberculosis by using percutaneously variously prepared tubercle bacilli which had been grown on Küss's medium. Some were killed with ether with varying periods of exposure; some were dried and mixed with thymus extracts; and some were killed by heat at 55°C. Different series of 20 guinea pigs each were treated, but in none of the animals was there developed any resistance or immunity. If guinea pigs are treated with killed typhoid bacilli percutaneously they develop agglutinins for these bacilli, but further treatment causes them to disappear. The author feels that tubercle bacilli can pass through the uninjured skin of the guinea pig, as cited by Koenigsfeld, and he hoped thus to produce a certain amount of immunity or resistance to tuberculosis by using attenuated bacilli.—*Perkutane Immunisierungsversuche an Meerschweinchen gegen Tuberkulose, J. Bürgers, Ztschr. f. Tuberk., 1933, lxviii, 56.*—(*H. J. C.*)

Fixation of Bacteria in Immune Body.—When bacteria are deposited in the tissues of the immune body the danger of septicaemia and metastasis of infection to distant tissues is far less than in the non-immune body. It has been taught that the bacteria are held fixed, where they lodge by the mechanical effects of the inflammation which appears about them. The immune body is also frequently hypersensitive to the products of the infecting bacteria, and under these conditions the tissues are more severely damaged wherever the bacteria lodge, and inflammation is consequently accelerated and exaggerated at the site. There are many objections to the conclusion that the spread of bacteria in the immune body is inhibited primarily by the process of inflam-

mation. Chief among them is the fact that in natural infection the site at which bacteria lodge in the tissues is not an area of previously established inflammation but a normal area, and the inflammation appears *after*, not *before*, the bacteria lodge there. If an irritant, which produces an inflammatory reaction capable of inhibiting the spread of bacteria subsequently deposited there, be injected into normal tissues together with the bacteria so that an accelerated inflammation begins just *after* the bacteria reach the tissues, as is the case in natural infection and in allergic reactions in particular, the spread of the bacteria is never inhibited and is often actually accelerated. Since bacteria begin to drift immediately from the site where they lodge in the nonimmune body, it becomes entirely unlikely that in the immune body an amount of inflammation sufficient to wall them in mechanically could appear rapidly enough to stop their immediate drift from the site. Not even the accelerated inflammation of allergy appears quickly enough to accomplish this. Tubercle bacilli have been shown to spread rapidly from the point of inoculation, whereas hours elapse before any trace of inflammation becomes visible macroscopically at the site even in the allergic, immune body in which the movements of the bacilli are supposed to be inhibited. The present experiments were undertaken to study microscopically the course of events at the site of infection in the immune and nonimmune body. Type I pneumococcal infection of the skin of the rabbit was chosen for the purpose of this study for the following reasons: The infection runs a rapid fatal course (24 to 36 hours) in the nonimmune rabbit; the bacteria spread rapidly from the site of inoculation, a spreading local lesion develops and septicaemia is well established after a few hours; a high degree of allergy and of immunity can be established by vaccination with dead organisms; in the immunized animals bacteria are well localized, septicaemia does not occur, and the animal survives; immunity in this infection can be completely separated from allergic inflammation; and finally the pneumococcus can be stained very readily in sections and the movement and fate of those injected can thus be followed microscopically with ease. *The local immobilization of pneumococci in the immune, allergic body:* Rabbits were rendered immune and allergic by the repeated intravenous inoculation of heat-killed type-I pneumococci followed by a series of intracutaneous injections of the germs. These rabbits, together with the untreated controls, were infected intracutaneously with a virulent culture of type-I pneumococcus. For this purpose the straight culture was diluted 1 to 5 or 1 to 10. The hair having been removed, 0.1 cc. of the diluted living culture was usually injected intracutaneously at each of the two widely separated sites in both the immunized and control animals, so that one site of infection could be removed for microscopical study at any desired period and the other left as a test of immunity. Blood-cultures were made at frequent intervals throughout the experiments. Sites of infection were removed from both the immunized and control animals at intervals ranging from five minutes to twenty-four hours. The lesion at the site of inoculation in the immune animals appears as a sharply outlined raised area of rather angry appearance at the end of seven hours. At this time only a slightly elevated pale lesion is visible in the controls. The lesion in the nonimmunes, however, soon becomes progressively larger, spreading downwards until it finally covers an area from the top of the back to the under surface of the abdomen. Haemorrhages begin to make their appearance, and before the animal dies the entire lesion may be uniformly purple from confluent haemorrhages. In contrast, the lesion in the immune animal remains sharply localized, far smaller in size, and haemorrhages practically never appear. Blood-cultures become positive in about five hours in the control animals, whereas in the immune animals the cultures remain sterile throughout the experiment. From the blood-cultures and from the gross appearance of the lesions it is perfectly obvious that the bacteria spread rapidly through the tissues of the nonimmune animals and invade the blood-stream, whereas in the immune animals the spread is prevented by some means. The earlier appearance of inflammation in the immune animals cannot be wholly responsible for the phenomenon. Microscopical study of the sites of infection removed at various intervals showed that in the immune animal the bacteria simply remained at the spot where they were injected, as though stuck fast to the cells of the tissues, in contrast to the manner in which they drifted freely from the site through the tissues in the nonimmune animal. Regardless of how highly immunized the animal might be, the bacteria invariably proliferate for a while in the immune body, but the pneumococci remain adherent to each other after division, so that clumps and chains are formed until, finally, little colony-like tangled masses of cocci are produced. The first difference that becomes apparent between the reaction in the immune and the nonimmune animal is this clumping of the pneumococci in the former and the complete absence of clumping in the latter. This is plainly ob-

servable as early as thirty minutes after the bacteria have been deposited in the tissues. Both the clumping of the bacteria and their adherence to the site are clearly in evidence before any appreciable inflammation appears. Usually at the end of four hours, inflammation is well established in the allergic animal. The bacteria are surrounded by leucocytes, which, after twelve to twenty-four hours, engulf and destroy the pneumococci. The necrotic tissue becomes liquefied, and the result is a typical, circumscribed abscess. Several hours longer are required for the inflammation at the site of infection to reach the same degree of intensity in the nonimmune animal and the inflammation is a diffuse and spreading one from the beginning. Phagocytosis of the pneumococci is very slight and practically all the bacteria are found to be extracellular throughout the entire duration of the infection. The wall of leucocytes in the immune animal is formed about the bacteria *because they remain concentrated and stationary in one spot*, rather than that the bacteria remain at the spot primarily because the wall of leucocytes prevents their escape, as is ordinarily stated. Undoubtedly, when it is finally formed, inflammation plays an important and essential rôle in maintaining the localization of the infection, but there is no question of the bacteria being primarily held at the immediate site by its effect. The bacteria simply remain sharply where they are placed in the immune body as though lightly adherent to the tissues and the inflammation develops later about them. *The local fixation of bacteria in the absence of allergic inflammation:* In pneumococcal infection immunity can be clearly separated from allergic inflammation by injecting the serum of an animal, immune and allergic to the pneumococcus, into the veins of the normal one. The immunity is transferred, but not the hypersensitiveness. A series of rabbits was passively immunized and injected intracutaneously as in the previous experiment. At each stage of the process the amount of inflammation in these animals was found to be only the merest fraction of that which occurred in the allergic animals, and yet the bacteria remained sharply confined at the site at which they were deposited so that the relatively insignificant outpouring of polymorphonuclear leucocytes was sufficient to dispose of them. The clumping and adherence of bacteria to the tissues of these passively immunized animals was entirely independent of inflammation. *The mechanism responsible for the fixation of the bacteria:* The precise nature of the immobilizing mechanism is not entirely clear. The factor responsible is contained in the body fluids, for the phenomenon occurs brilliantly in the passively immunized body, or indirectly if bacteria and immune serum are mixed and injected immediately after mixing. It is therefore evident that the immobilization is a specific process dependent on the immune antibody. One factor which must interfere with the spread of bacteria in the immune animal is the tendency of the bacteria to form clumps. In the tissues of the immune animal the pneumococci grow exactly as they do in immune, agglutinating serum: they adhere to each other after division, and grow, therefore, in twisted chains and colony-like masses instead of diffusing through the medium. The phenomenon of the local fixation of bacteria is not entirely a result of agglutination. In the immune body the bacteria from the very beginning seem actually to adhere to the tissues with which they have first come into contact. It seems seems quite possible that just as the bacteria when covered with antibody adhere to themselves (agglutination) and to the surface of the leucocyte (opsonization), so may they also adhere to the cells and fibres of the tissues where they lodge. A comparison of the sections of the early stages of the infection in the actively and passively immune with those of the nonimmune animals leaves no doubt that, under the specific influence of the immune antibody, and independently of inflammation or lymphatic obstruction, the bacteria are held fast at the immediate site where they lodge as though actually adherent to the fixed cells and fibres of the tissues. *Conclusions:* In the nonimmune body pneumococci drift freely through the tissues from the site where they are deposited and readily invade the bloodstream. In the actively or passively immunized body the bacteria are held sharply at the immediate site where they lodge. This is accomplished by the specific action of the immune antibody, which, through its effect upon the bacteria, causes them to remain fixed to the tissues at the site where they lodge until they can be surrounded and destroyed by the leucocytes (inflammation). The process of immediate fixation of bacteria in the immune body occurs independently of inflammation, and is in operation before any effective amount of inflammation is established at the site. Inflammation, when fully established, is of great importance in contributing to the localization of the infection and in effecting the destruction of the bacteria, but the accelerated and exaggerated inflammation of allergy is not required for the successful performance of either of these two protective functions.—*The Mechanism Responsible for the Prevention of Spread of Bacteria in the Immune Body, A. R. Rich,*

Bull. Johns Hopkins Hosp., March, 1933, lii, 203.—(J. S. W.)

Protection Due to Primary Infection.—Observations were made by the author on 84 children found in a series of more than 10,000 cases examined and followed up during the past decade at Lymanhurst. These 84 children included certain patients who had reinfection pulmonary tuberculosis (consumption) when first examined, as well as other children in whom phthisis developed during the period of observation. Of this group, 36 children (approximately 43 per cent) had primary tuberculosis exclusively for various periods up to ten years and then developed the reinfection type of pulmonary tuberculosis. Primary tuberculous infections, therefore, do not prevent consumption from developing at some later date. Twenty-five children (approximately 30 per cent) had primary or reinfection pulmonary tuberculosis coexisting when first examined. These observations are interpreted as contributing circumstantial evidence that initial infections by *Mycobacterium tuberculosis* do not confer an immunity that prevents consumption. No child allergic to tuberculin has been found during the past decade in whom a second crop of lesions typical of primary tuberculosis has developed. When new tuberculous infiltrations appear in the lungs of children who previously had positive tuberculin reactions, these newly developed lesions are roentgenologically and clinically characteristic of reinfection pulmonary tuberculosis (phthisis). Apparently, patients with primary tuberculosis become consumptive if reinfections occur in dosage sufficient to produce intrapulmonary lesions. Follow-up studies over a period of ten years indicate that primary tuberculous infections are distinctly detrimental in that the patient is doomed thereafter to develop consumption if successfully reinfected from exogenous or endogenous sources. Active immunization against tuberculosis with attenuated bacilli may not be a safe procedure if this method immunologically duplicates the changes that accidental infection produces.—*Does a Primary Tuberculous Infection Afford Adequate Protection Against Consumption?, C. A. Stewart, J. Am. M. Ass., April 8, 1933, c, 1077.—(G. L. L.)*

Experimental Tuberculosis of Cornea in Animals.—Experiments by Vorwald have shown that a large percentage, perhaps the majority, of the cells taking part in the formation of tubercles in the lung come from the blood-stream. His observations brought out again with unusual clarity the facts that in the course of tubercle development there is an immediate influx of polymorphonuclear leucocytes at the point of lodgment of the tubercle bacilli and a subsequent phagocytosis and replacement of these cells by large mononuclear cells. The apparent vascular origin of most of the cells concerned suggested the value of a similar study of tubercle-formation in different animals in the nonvascular cornea. It also seemed possible that differences in the rate of tubercle-growth in different animals might be still more conspicuous in this organ. Normal and tuberculous guinea pigs, and normal rabbits and cats were used. Interlamellar injections of human tubercle bacilli (H37 of Saranac Lake) were made with sharp, short-bevelled, fine-gauge, hypodermic needles in or near the centre of the cornea in each case. Approximately 0.01 mgm. of tubercle bacilli were injected in each of the rabbits and cats, and half as much in each of the guinea pigs. A sharply limited white opacity suddenly appearing in the cornea in the region inoculated, following slight pressure of the loaded syringe after the needle was in place, signalized the success of the injection. Animals of each kind were killed at 6 hours, 1, 3 and 14 days, and 1 month, and the nature and extent of the inflammatory response determined by microscopic examination. In all cases the first reaction noted was at the limbus, and not at the site of injection. The reaction consisted of an outpouring of polymorphonuclear leucocytes from the marginal vessels. It was most intense in the tuberculous guinea pig (tuberculin reaction), less in the normal guinea pig, still less in the rabbit, and least in the cat. The first cellular reaction at the site of injection in the centre of the cornea consisted of leucocytes migrating in from the margin. This reaction was well developed in all animals at 24 hours, and the cells taking part were almost exclusively polymorphonuclear leucocytes. After 24 hours there was a gradual increase in the proportion of large mononuclears in the reaction. The rate of increase rose with the advent of blood-vessels, as vascularization of the cornea developed. The paucity of these cells at the earlier periods and abundance in the vascularized state of the cornea seemed good evidence that the large mononuclear leucocyte in corneal tuberculosis is not locally derived, as formerly claimed. In all animals the large mononuclears, as they reached the site of infection, engulfed the polymorphonuclear leucocytes, already there, taking over the bacilli contained by the latter cells. From 3 days to 2 weeks the inflammatory reaction progressed most rapidly in the tuberculous guinea pigs, and less rapidly in the normal guinea pigs, rabbits

and cats, in the order named. Ulceration occurred in the tuberculous guinea pigs in 2 weeks, and these animals were dropped from the series at this point. At 1 month, the last period studied, the intensity of inflammatory reaction, as determined by the size of the lesion and proportion of the cornea involved, was greatest in the guinea pig, less in the rabbit, and least in the cat. This order is in inverse relation to the general resistance of these animals to the strain of tubercle bacillus used.—*A Comparison of the Cellular Reaction in Experimental Tuberculosis of the Cornea in Animals of Varying Resistance, E. R. Long, S. W. Holley and A. J. Vorwald, Am. J. Path., May, 1933, ix, 329.*—(*J. S. W.*).

Experimental Tuberculosis of Bones.—The development of tuberculous bone lesions was studied in rabbits following the infection with bovine bacilli. One series of animals was infected intracardially and another subcutaneously and intraärticularly. The arteries in the bones and marrow never showed specific alterations, but the tubercles had frequently a perivascular distribution. In the myeloic bone-marrow of the diaphysis of tubular bones, tubercles develop slowly and do not undergo caseation, while tubercles in the metaphysis caseate partially and persist for a longer time. In the fat-marrow, tubercles do not develop. Rabbits, the same as men, are more susceptible to disease in the epiphysis. But this does not depend on the vascular distribution, as it is the manifestation of a different local resistance.—*Experimentelle Beiträge zum Studium der Knochentuberkulose, M. Mandelstamm, Beitr. z. Klin. d. Tuberk., January, 1933, lxxxii, 98.*—(*M. P.*)

Experimental Infection with Mixed Tubercle Bacilli and Nonspecific Substances.—Guinea pigs were infected with large doses of living virulent tubercle bacilli mixed with killed staphylococci, saponin or calcium chloride. All the test animals lived longer than the control animals and the tuberculous process was of a favorable character. The best results were obtained with the killed staphylococci. The basis of the prolongation of life is believed to be a retardation of development of the tubercle bacilli at the site of injection. The question whether there occurred a decrease of virulence requires further experimentation.—*Experimentelle Tuberkulose bei Infektion mit Tuberkelbazillen im Gemisch mit unspezifischen Stoffen, W. A. Lubarski and A. F. Korshinskaja, Zeitschr. f. Tuberk., 1932, lxvi, 223.*—(*H. J. C.*)

Trigeminal Cardiopulmonary Reflex in Pulmonary Tuberculosis.—A test of latent autonomic tonus is described, based on the fact that stimulation of the cutaneous area supplied by the trigeminal nerve is particularly effective in evoking autonomic reflexes. Two rubber-bags, filled with water at a temperature of 43° C., are placed over the cheeks of the patient. Within thirty seconds to two and one-half minutes, in the presence of sympatheticotonia, the pulse-rate increases and the arterial pressure rises, and in the presence of vagotonia the reverse occurs. This test is more trustworthy than the oculocardiac reflex as the act of pressing on the eyeball alarms the patient and disturbs the result. This test achieves a high correlation with clinical findings in cases exhibiting frank autonomic imbalance. The circumscribed malar flushing and mydriasis so commonly observed in tuberculosis patients results not only from direct neurovegetative irritation (as by pleurisies, apical symphyses, etc.), but also by reflex action from the diseased lung. It is thus possible that the test above described may evoke latent phenomena of this type. Of 150 patients with pulmonary tuberculosis examined in this way, 85 per cent were apparently vagotonic, 7 per cent sympatheticotonic, and 8 per cent neutral. In all but 3 cases malar flush was prolonged on the side homolateral with a unilateral lesion and more pronounced on the side of greatest involvement when this was bilateral, particularly when the lesion was ulcerocavernous and progressive. It is suggested in conclusion that this test may be a diagnostic aid.—*Le réflexe trigémino-cardio-pulmonaire et sa valeur dans la tuberculose pulmonaire, P. Caryophyllis, Rev. d. l. Tuberc., November, 1932, xiii, 937.*—(*A. E. M.*)

Psychic State in Tuberculosis.—There is no unique psychic-reaction trend in tuberculosis. Study of individual cases reveals rather the effect of a disease on a certain psychic soil. The usual effect of first realization of the disease is depressant. The subsequent readjustment depends on the previous reaction tendencies of the patient. If usually optimistic he will subsequently regain that state and *vice versa*. Tuberculous optimism as such does not exist. Similarly the terminal euphoria commonly observed in tuberculosis, but not specific for it and which is sometimes termed bacillary euphoria, is an infantilism, an indication that the patient no longer logically understands the significance of nor correctly interprets his symptoms.—*L'état psychique dans la tuberculose, M. Schachter, Rev. d. l. Tuberc., February, 1933, i, 167.*—(*A. E. M.*)

Horner's Syndrome Following Intrapleural Cauterization.—*Case Report:* Intrapleural cauterization was performed in a young woman because artificial pneumothorax failed to close a cavity. A thin upper-lobe adhesion was easily severed; while a wide membranous adhesion in the paravertebral region, close to the azygos vein, was also cauterized. Complete collapse of the lung followed. Several days afterward the patient developed Horner's syndrome. No operation had been performed on the patient's neck, and the patient did not remember any pressure having been applied in the cervical region. Ruling out such possibilities, it is concluded that in this case the ocular fibres of the sympathetic nerve must have originated much lower than usually and that they were probably injured by the cauterization of the paravertebral adhesion. —*Ein Fall seltener Komplikation nach endopleuraler Kaustik, G. Zimmermann, Beitr. z. Klin. d. Tuberk., June 24, 1933, lxxxiii, 117.*—(*M. P.*)

Man and Machines in Diagnosis of Tuberculosis.—The conflict between man and machines is discussed as it is manifested in methods, such as sputum examinations and roentgen-ray examinations of the lungs, used in the diagnosis of pulmonary tuberculosis. It is pointed out that the reluctance of clinicians to accept new methods, which they have not tried, promotes a desire among bacteriologists and roentgenologists to deal directly with the patient or the family doctor, and eliminate the critical clinician, or "middleman." Some roentgenographic manifestations considered as pathognomonic of pulmonary tuberculosis are described, such as (1) changing irregular apical mottling with intensification of the shadows of the apical bronchioles; (2) areas of changing extent of lung rarefaction with only slight demarcation from healthy tissue; (3) uniformly small shadows scattered uniformly in both lungs; and (4) mottling gradually developing around calcified foci in the lung parenchyma.—*Man and Machines: Clinicians and Technical Contrivances for the Diagnosis of Tuberculosis of the Lungs, H. B. Shaw, Brit. J. Tuberc., July, 1933, xxvii, 99.*—(*R. M. F.*)

Prompt Recognition of Tuberculosis of Lung.—The charts of 830 patients with pulmonary tuberculosis were examined in order to find out in what percentage the correct diagnosis was arrived at within a reasonable length of time (arbitrarily a two months' period from the onset of symptoms), and the most important causes for delay and wrong diagnosis. It was found that 60 per cent of the patients were properly diagnosed within two months of the onset of symptoms. In the rest of the patients the diagnosis was delayed from two months to more than three years. Tuberculous processes were misdiagnosed, in the order of frequency, as follows: bronchitis, rheumatism, nervous diseases, gastrointestinal disturbances, cardiac disease, anaemia, "flu" and pleuritis. In the conclusion, the great importance of roentgenological examination and of sputum studies is emphasized.—*Wie steht es mit der rechtzeitigen Erkennung der Lungentuberkulose? K. Zech, Beitr. z. Klin. d. Tuberk., April, 1933, lxxxii, 509.*—(*M. P.*)

Monocyte-Lymphocyte Index.—Supravital blood stains, according to Sabin, are necessary for the differential diagnosis of the various mononuclear cells in the blood of experimental animals. In human blood these various forms can be differentiated well enough by the usual fixed-smear method. The monocyte-lymphocyte index was found to change with the progression of the disease in experimental infection in confirmation of the work of Sabin and her associates. In children, a high monocyte-lymphocyte index is found most frequently in progressive, usually fatal tuberculosis; it is, therefore, a sign of poor prognosis.—*Experimentelle und klinische Untersuchungen über den Monocyten-Lymphocytenindex in der Tuberkulose bei Anwendung der supravitalen Blutfärbungsmethode, J. Zeyland, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii, 199.*—(*M. P.*)

Demonstration of Tubercle Bacilli in Diagnosis.—Based on the routine examination of 24,623 specimens of sputum, urine, gastric contents and pleural fluids, of these specimens 5,032 were found positive by microscopical examination, and in addition, 48 were positive by culture and 78 by animal inoculation. No specimen yielded a positive culture which did not produce tuberculosis in a guinea pig. Animal inoculation and culture should always be performed on such specimens, the results of which may decide surgical interference.—*Der Tuberkelbacillennachweis in der diagnostischen Praxis, A. Kairies, Beitr. z. Klin. d. Tuberk., June 24, 1933, lxxxiii, 112.*—(*M. P.*)

Detection of Tubercle Bacilli in Diagnosis.—The usual examination of the sputum for tubercle bacilli by the Ziehl-Neelsen technique is simple and generally reliable. Modifications by Konrich, Spengler, Jötten and Haarmann are supposed to improve upon the original. The Gaffky scale is still often used and is helpful. At times repeated examinations of direct smears are

necessary and eventually concentration methods are resorted to with advantage. The concentration method of Velicogna requires only a few minutes. If these and other methods give negative results, the culture method is the next choice, and it often gives a higher degree of positive findings than the other methods. The egg medium of Lubenau is of special value. Krause obtained by culture an increase of positive findings, amounting to 25 per cent in otherwise negative sputa. The Schiller culture method, in which 2 cc. of sputum are mixed into an emulsion with a solution of glycerine, glucose and water, shows positive growths after 1, 2 or 3 days in the incubator. Some investigators consider animal inoculation superior to the culture method, except in the study of urine and pleural fluid. Some demand both methods at the same time. If no sputum is obtained, as is frequently the case in children, examination of material from the pharynx or larynx may prove successful. This material may be examined by direct smear, concentration, and culture or animal inoculation. Material may be obtained from the trachea by suction and from the gastro-intestinal tract by lavage. Faeces may be examined by smear or culture. Tubercle bacilli are obtained from the stomach in minimal pulmonary lesions and also in extra-pulmonary disease such as meningitis. Centrifugation of the stomach contents of 143 tuberculous patients, in whom no sputum could be obtained or the sputum was negative, and examination by direct smear yielded tubercle bacilli in twenty-three. Culture or animal inoculation no doubt would have increased this percentage. Animal inoculation is especially important in the examination of the urine. The examination of the cerebrospinal fluid is best made with the spontaneously settled film, either on plain smear, culture or animal inoculation. In recent years the demonstration of tubercle bacilli in the blood has awakened much interest and controversy. It is generally recognized that tubercle bacillaemia may occur at all stages of tuberculosis although the recent extravagant claims of several workers cannot be verified. Blood cultures in 25 far-advanced cases of pulmonary tuberculosis were positive in only one case (miliary tuberculosis). Examination of the urine is possibly more valuable than examination of the blood in cases of bacillaemia.—*Über Tuberkelbazillennachweis, H. Scholz, Deutsche med. Wchnschr., February 24, 1933, lix, 289.*—(*H. S. W.*)

Bacillaemia and Bacilluria in Tuberculosis.—Loewenstein's cultural method appeared to be a welcome means to study the frequency of haemotogenous metastases in tuberculosis, but the results were very disappointing. The blood of 287 patients was used for repeated seeding but cultures were obtained only in four instances from the blood of three patients. Since the circulating blood cannot be withdrawn daily the presence of tubercle bacilli in the urine was investigated and twenty-four hour specimens were planted every day for three weeks or longer on Hohn's or Loewenstein's media. Of 31 patients whose urine was used for daily cultures 12 gave positive results. All these patients had a positive sputum but no symptoms whatsoever of genito-urinary tuberculosis. Patients who had artificial pneumothorax or surgery of any kind were mostly selected and the cultures frequently were successful on the day of or following surgical intervention. The kidney function was determined in all positive cases and found normal. Furthermore seven of the patients in whose urine tubercle bacilli were demonstrated came to autopsy but no pathology was found in the kidneys. It seems therefore that the normal genito-urinary tract is permeable to tubercle bacilli which are present in the circulating blood. The presence of bacilli in the urine does not necessarily indicate renal tuberculosis and the method which has been described is recommended as a means to study the frequency of bacillaemia in tuberculosis.—*Bacillaemie und Bacillurie bei Tuberkulose, H. Deist, Klin. Wchnschr., January 7, 1933, xii, 26.*—(*K. F.*)

Bacillaemia in Experimental Tuberculosis.—Blood-cultures, by Kirchner's method, were made from experimentally infected rabbits. Of all specimens 30.1 per cent were positive. The frequency of positive results depends on the virulence of the bacilli and the mode of infection.—*II. Der kulturelle Tuberkelbacillennachweis zum Studium der Bacillämie bei der experimentellen Kaninchentuberkulose, Chin kuk Choun, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii, 190.*—(*M. P.*)

Tubercle Bacillaemia.—It was ascertained in control experiments that Löwenstein's method for the demonstration of tubercle bacilli in the peripheral blood is efficient and reliable. A total of 522 blood-cultures were made from 332 patients with pulmonary tuberculosis. Only in 2 cases was it possible to demonstrate the presence of tubercle bacilli, which would indicate that tubercle bacilli are but rarely present in the peripheral blood in pulmonary tuberculosis. —*Zum Nachweis der Tuberkelbacillämie nach E. Löwenstein, J. Schramek, Beitr. z.*

Klin. d. Tuberk., April, 1933, lxxxii, 606.—(M. P.)

Tubercle Bacilli in Stomach and Faeces.—The value of stomach lavage and of the examination of faeces in finding tubercle bacilli in children was determined in a study of 101 cases. The ages of the children ranged from 8 months to 16 years. The type of cases studied varied from children who had no other pathologicoclinical signs than a positive tuberculin test to children who had bilateral destructive pulmonary tuberculosis. Only 27.7 per cent showed tubercle bacilli in the stomach contents. If guinea pigs were not used, the smear examination of stools yielded 7 per cent fewer positive results than the more cumbersome stomach lavage. The Armand-Delille modification did not, in the authors' hands, improve the routine stomach lavage as first suggested by Meunier. Sputum and throat-swab examinations gave positive results less frequently than did stool or stomach-lavage examinations. Clinically destructive pulmonary tuberculosis cases showed, in 75 per cent, positive stomach-lavage results against 28 per cent among the clinically non-destructive pulmonary-tuberculosis cases. Younger children did not show positive results more often than older ones. Clinically inactive cases yielded only negative results. Slightly and very active cases showed different proportions of positive results, and activity seemed to parallel the frequency of positive examinations. Positive stomach lavage for tubercle bacilli had a grave prognostic significance. Pathological chest signs, fever and cough generally parallel the frequency of positive results. The average age of the patients with positive stomach lavage was two years higher, the malnutrition somewhat less, and the average gain of weight about half as fast as among the cases who gave negative stomach-lavage results.—*Acid-Fast Bacilli in the Stomach Lavage and Feces of Tuberculous Children, C. Kereszturi, D. Hauptmann, B. Schick and L. Mishulow, J. Am. M. Ass., May 13, 1933, c, 1481.*—(G. L. L.)

Isolation of Tubercle Bacilli from Blood.—The technique of the isolation of tubercle bacilli from the blood-stream is reiterated. In three cases of traumatic sympathetic ophthalmia tubercle bacilli were demonstrated either both in the primarily diseased eye and in the blood or in the blood only. *Conclusions:* With the author's method tubercle bacilli can easily be isolated from the blood, particularly, too, soon after infection. Tubercle bacilli are present especially in the stage of progression. What is usually called tuberculous tissue is only one facultative phase in tuberculous-tissue alterations. The tubercle bacillus has a considerable affinity for blood-vessels and produces intimal tubercles, the latter being the sources of haematogenous propagation. The absence of tuberculosis may be stipulated only in the absence of tubercle-formation and of the bacillus. Until July 1, 1932, 9,000 blood-cultures were made, of which 2,592 were positive. With this method tubercle bacilli can be demonstrated in the blood in certain groups of diseases which previously has not been considered to be caused by the tubercle bacillus, such as lupus erythematodes, granuloma annulare, choroiditis and sympathetic ophthalmia, acute and chronic polyarthritis, chorea, multiple sclerosis, retrobulbar neuritis, and dementia praecox. In the latter diseases tubercle bacilli are demonstrable not only in the blood-stream but in the local lesions as well. The former fate of the implantation of tubercle bacilli depends very much on where the first implantation occurred. If it was in a tissue which is naturally highly resistant to tubercle bacilli, such as striated muscle or the thyroid, the entire body acquires a good resistance. If the first seeding occurs, however, in an organic system which is susceptible to tuberculosis the resistance of the whole system decreases. Metastases and recurrences are likely to strike repeatedly the same tissue.—*Die Technik der Züchtung eus dem Blute, E. Loewenstein, Beitr. z. Klin. d. Tuberk., May 22, 1933, lxxxii, 697.*—(*M. P.*)

Isolation of Tubercle Bacilli from Blood.—Loewenstein's media are eminently suitable for the isolation of tubercle bacilli. Tuberculous bacillaemia is a reality, but it exists only for brief periods. Fifty tuberculous patients, most of them progressive, yielded all negative results. In another group of 48 patients who were practically all in a moribund state 4 positive cultures were obtained from 3 different patients. From 14 patients with acute polyarthritis and from 5 with chronic polyarthritis only negative results were obtained.—*Züchtungsverfahren der Tuberkelbacillen aus dem Blut von Tuberkulösen und Polyarthritikern nach Löwenstein, D. Szüle, Beitr. z. Klin. d. Tuberk., May 22, 1933, lxxxii, 717.*—(*M. P.*)

Isolation of Tubercle Bacilli from Blood.—When tubercle bacilli reach the blood-stream they are phagocytosed by leucocytes. In attempting to recover such bacilli by cultural methods it is important that the bacilli are freed from the leucocytes and that in centrifugation they are thrown

into the sediment. In order to satisfy such requirements it is advocated to haemolize the blood with distilled water, and to acidify it in order to produce a precipitate which will enclose the bacilli in the final sediment. The cultivation should be done on the media previously recommended by the author.—*I. Zur Methodik des kulturellen Nachweises der Tuberkelbacillen im Blut, O. Kirchner, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii,* 183.—(*M. P.*)

Isolation of Tubercle Bacilli from Blood.—Numerous researches and studies have shown the absolute impossibility of recovering tubercle bacilli from the blood of animals with a definitely disseminated tuberculosis following the direct injection of tubercle bacilli into the blood-stream. It is possible that the virus is quickly withdrawn from the blood and fixed in the tissues which later show tuberculous lesions. It is planned to increase the infecting dose of tubercle bacilli and to inject tuberculin subcutaneously a short time before withdrawing the blood in order to create a state of lowered resistance and probably produce a rapid diffusion of the disease.—*Ricerche sulla possibilita di coltivazione del bacillo tubercolare dal sangue di animali infettati sperimentalmente, A. Gaeta, Lotta contro la tubercolosi, December, 1932, iii, 1278.*—(*U. E. Z.*)

Isolation of Tubercle Bacilli from Blood.—This is a careful and critical survey of the methods and results for the demonstration of tubercle bacilli in the peripheral blood. It is pointed out how difficult it is to make proper comparisons from one author to the next because many authors omit publishing absolute figures. It is further emphasized that Loewenstein's own figures decrease with his later papers. It is still entirely undecided what the significance is of only microscopically demonstrable acid-fast cultures and of such cultures which refuse to propagate on the next medium.—*Ergebnisse und kritische Betrachtungen über die Blutkultur von Tuberkelbacillen nach Löwenstein, H. J. Tiedemann, Beitr. z. Klin. d. Tuberk., May 22, 1933, lxxxii, 703.*—(*M. P.*)

Isolation of Tubercle Bacilli from Blood.—An analysis of Löwenstein's method (acetic-acid haemolysis and a medium containing aspargine, egg and potato flour) discloses that the medium is satisfactory for growing small numbers of tubercle bacilli, but that the preparation of it is unnecessarily involved, containing as it does a few unessential, expensive materials, and that acetic acid as used by him is bacteriostatic to small numbers of tubercle bacilli, as determined by actual static tests and by practical tests with human and animal blood containing tubercle bacilli, which were recoverable by another method (sulphuric acid treatment and inspissated glycerol-water-egg-yolk medium). Acetic acid, as used by Löwenstein, is innocuous to saprophytic acid-fast bacilli, and if these are present in the blood, they may be recovered by this method, but not by the sulphuric-acid method.—*An Analysis of Loewenstein's Methods for Isolating Tubercle Bacilli from Blood, M. L. Cohn, J. Infect. Dis., March—April, 1933, lii, 214.*—(*F. G. P.*)

Isolation of Tubercle Bacilli from Blood.—In miliary tuberculosis as well as in fatal chronic pulmonary tuberculosis with fatal issue, tubercle bacilli were cultivated from the blood in 85 per cent of the cases, while in all other cases of tuberculosis, including those with organic tuberculosis, with stationary pulmonary changes, with indurated cavities, caseous foci, encapsulated nodules, and apical indurations, and also in cases without the presence of tuberculous changes, the findings were entirely negative. Even progressive cases of pulmonary tuberculosis were found negative if this was not the cause of death. The authors believe they could exclude agonal and postmortem bacillary increases or flooding from the lymphatics. Among the positive cases of generalization there were 10 of 11 adults positive and of 5 children 2 were positive. Among the cases of early generalization 12 to 16 were positive and in chronic progressive fatal pulmonary tuberculosis 18 of 20 were positive. The Loewenstein method was used.—*Zur Tuberkelbacillenzüchtung aus dem Leichenblut, H. Popper, F. Bodart and W. Schindler, Virchow's Arch. Pathol. Anat., 1932, cclxxxv, 789.*—(*H. J. C.*)

Tubercle Bacilli Isolated from Blood in Polyarthritis.—Of 10 strains of tubercle bacilli isolated from the blood of acute polyarthritics, 9 were found virulent for guinea pigs and the tenth was nonpathogenic for guinea pigs but highly so for rabbits and chickens. Seven of the strains were pathogenic for rabbits and of these two were avian tubercle bacilli. Only 2 strains were pathogenic for chickens. Three human strains produced no disease of any kind in rabbits or chickens in spite of 8 months' observation. Only Loewenstein's culture procedure can give the incidence of tubercle bacilli. Animal inoculation cannot be performed with the whole blood but only with the washed sediment. Animals must be kept under observation for a long time. Culture is su-

perior to animal inoculation, as is evident from the positive results obtained. More extensive observations are essential to clarify the relation between tubercle bacillaemia and the clinical symptoms of polyarthritis.—*Virulenzprüfung aus dem Blute von Polyarthritisfällen gezüchteter Tuberkulosestämme, G. C. Torri, Ztschr. f. Tuberk., 1932, lxvi, 129.—(H. J. C.)*

Isolation of Bovine Tubercle Bacilli.—A liquid medium consisting of a synthetic medium plus serum was found to be very suitable for the isolation of bovine tubercle bacilli. At the same time this medium permits making the differential diagnosis between bovine and human strains.—*Über einen Nährboden von besonderer Eignung für die Erstzüchtung des bovinen Tuberkelbacillus. Zugleich ein Beitrag zur kulturellen Typenbestimmung, O. Kirchner, Beitr. z. Klin. d. Tuberk., June 24, 1933, lxxxiii, 39.—(M. P.)*

Diagnosis of Small Pleural Effusions.—With all the improvements in methods of examination the diagnosis of small pleural effusions is fraught with difficulties and at times may be impossible, when the accumulation of small amounts of fluid in the posterior costophrenic sinus cannot be demonstrated by either physical examination or X-ray. The following technique of percussion can be used to great advantage for the detection of small pleural effusions. The sternum of the standing or sitting patient is percussed with the cups of the slightly bent fingers of one hand. The repeated short strokes of percussion are transmitted as dull sounds to the auscultating ear which is placed at the patient's back. In case of an effusion the percussion note is of higher pitch and is consonating in character. Both phenomena are explained by the change in the elasticity of the chest-wall, due to an accumulation of fluid and by the increased resonance and better transmission of vibrations. The same factors may account for the production of metallic phenomena particularly the *signe des sous* of Pitres.—*Beitrag zum Nachweis von Flüssigkeitsansammlungen im Pleuraraum, H. Dopsch, Wien. klin. Wchnschr., November 11, 1932, xlv, 1415.—(K. F.)*

X-Rays in Tuberculosis.—Ten years of careful observation and study in the field of tuberculosis have resulted in a complete reversal of views in such major factors as the tuberculin test and roentgen examination, so that there remain few significant controversial subjects in this field. Transparent X-ray films, now in general use, have been greatly improved in the past decade but still are not all that could be desired. The present equipment for making X-ray films is too slow in operation for the increased demands for greater numbers of X-ray examinations. The new rapid X-ray camera meets the demand by making from 500 to 1,000 exposures a day with ease. The new paper X-ray film in rolls has reduced the cost of films by about one-half. The paper film does not reveal the same detail as the transparent film, but the difference in clarity is slight, probably not more than 10 per cent. The paper film will not displace the transparent film for certain types of work. It should not affect the cost of X-ray work in private practice, since the major part of the charge made the patient in the past has been based on the physician's ability to interpret the shadows. The medical profession should support this rapid and much cheaper method of making roentgen examinations, since it has merit and makes roentgen examinations possible for large numbers of persons who otherwise would not have them.—*Progress in the Diagnosis of Tuberculosis; with Special Reference to the X-Rays, J. A. Myers, J. Am. M. Ass., June 24, 1933, c, 2004.—(G. L. L.)*

Fluoroscopy of Diaphragmatic Function.—Careful fluoroscopic observations add important information to clinical findings. On deep breathing one may find impaired diaphragmatic movement, particularly impairment of its expiratory excursion. Such findings may yield important data concerning the function of the respiratory system and the elasticity of the pulmonary tissue.—*Beobachtungen der Zwerchfelltätigkeit vor dem Röntgenschirm, R. Menzel, Beitr. z. Klin. d. Tuberk., June 24, 1933, lxxxiii, 50.—(M. P.)*

Triangular Roentgen Shadows of Pulmonary Bases.—An explanation is suggested fort he presence of triangular shadows rather frequently observed in the posterior and inferior portions of the lower lobes, which, as Rist particularly has emphasized, are most frequently associated with bronchiectasis. Rather than resulting from posterior mediastinal pleurisy, or from pleural adhesions, or as indicating the presence of localized splenopneumonia, as previously suggested, such shadows result most commonly from a deviation outward of the costomediastinal sulcus of the inferior part of the lower lobe under the influence of peribronchial sclerosis and atelectasis.—*Image postérieure triangulaire pseudo-pleurétique des bases pulmonaires, A. Bernou, Rev. d. l. Tuberc., May, 1933, i, 470.—(A. E. M.)*

Multiple-Puncture Tuberculin Test.—The multiple-puncture cutaneous tuberculin test is performed by an instrument which consists of a short handle, carrying at one end 5 needle-points fitted with a protective cap. After the skin is cleansed with methylated ether, a drop of undiluted Old Tuberculin is transferred from a bottle to the skin by the flat spatula-end of the instrument. The ends are reversed. The needle-points are applied to the portion of the skin covered with tuberculin. Because the needles are graduated in length, this is done by holding the handle of the instrument at an angle of 30° to the skin surface. By quick, firm pressure applied at right angles to the test area, all 5 needle-points simultaneously penetrate the superficial skin layers. The needles are withdrawn and superfluous tuberculin wiped off. The result of the test is read in forty-eight to ninety-six hours. The following claims are made in favor of the test: Simplicity of the instrument, simplicity and rapidity of the technique, painlessness, absence of local trauma and systemic reactions, the needlessness of repetition of the test, and the sensitivity and reliability of the test.—*Multiple-Puncture Cutaneous Tuberculin Test, W. S. Craig, Brit. M. J., February 4, 1933, no. 3761, 184.*—(*T. O. R.*)

Tuberculin Patch Test.—This test is performed by applying to the skin a patch of adhesive tape (about 3 x 3 cm.), previously moistened with one to two drops of Old Tuberculin. A positive reaction is indicated by an area of redness studded with papules and vesicles. In the 176 children in which this test was applied it checked with the Pirquet test in 169 (96 per cent). It has the advantage over the Pirquet test of being painless and of obviating the use of instruments. It is particularly suitable for use in private practice.—*The Tuberculin Patch Test: a Diagnostic Aid in Tuberculosis, M. Grozin, Am. J. Dis. Child., July, 1933, xlvi, 17.*—(*M. D.*)

Serodiagnosis of Tuberculosis.—The practical value of serological tests depends on their reliability as a diagnostic aid. Failures can be attributed to a deficient formation of antibodies, and group-reactions due to other acid-fast bacilli may be the cause of noncharacteristic reactions. With the present improvement in technique, serological tests, especially complement-fixation, can be used to great advantage in the diagnosis of tuberculosis. The autoprecipitin test, according to Lehman-Facius and Löschke, gave positive reactions in a number of cases of polyarthritis and for this reason complement-fixation tests were included in this study. The Neuberg-Klopstock reaction was positive in 34 cases of a group of 89 patients with active pulmonary tuberculosis and gave negative results in 99 per cent of the control cases. In a group of 300 sera, the Neuberg reaction was then compared with the reaction according to Witebsky-Klingenstein and Kuhn, and it was found that the latter is by far the more sensitive method. Consequently, the Witebsky reaction was used in a larger group of 1,400 sera, and the percentage of positive results in active pulmonary tuberculosis was considerably higher than in the first series. Negative results were, on the other hand, more frequent in inactive disease. It is noteworthy that the reaction becomes negative with clinical improvement, especially in pneumothorax cases. In extrapulmonary tuberculosis the reaction proved of great value, and pointed to a tuberculous aetiology at a time when diagnosis by other methods was not possible. In tuberculosis of the skin, however, complement fixation is very unsatisfactory; the percentage of failures with both methods was too high for a specific test to be of diagnostic value. In a series of 100 sera from healthy soldiers, 3 positive reactions were found; the ensuing clinical and radiographic examinations revealed active pulmonary tuberculosis in one reactor; and the second positive serum came from a patient with a suspicious lung lesion, whereas in the third case no reason for the positive reaction could be found. Among the negative reactors acute infections, pneumonoconiosis, and other diseases of the lung were frequently present. It is finally pointed out that the Witebsky and Wassermann reactions do not run parallel and that complement-fixation, according to Witebsky, is simple, highly specific and very sensitive.—*Zur Serodiagnostik der Tuberkulose, J. Hämel and H. Horster, Klin. Wchnschr., March 25 1933, xli, 460.*—(*K. F.*)

Complement-Fixation with *S* and *R* Antigens.—Complement-fixation in tuberculosis has for the most part failed to show any definite correlation between the concentration of complement-fixing substances in the blood and the state of immunity or resistance to infection in the patient. It has also failed as an index of the activity of the disease. Recently Rice and Reed have shown that sera from rabbits immunized with killed *S* tubercle bacilli reacted much more strongly with the antigens made from virulent, or *S* cultures, than with antigens made from avirulent, or *R* cultures of tubercle bacilli. On the other hand, the sera of animals immunized with killed *R* organisms fixed about the same amount of com-

plement in the presence of both antigens. It seemed of interest, therefore, to carry out parallel tests with *S* and *R* antigens on a series of human sera. A highly accurate measure of the antibody titre of each serum was obtained by the quantitative technique of Wadsworth, Maltaner and Maltaner, a procedure in which the total amount of complement reacting with the sensitized antigen and red cells to give a final reading of 50 per cent haemolysis is used as a unit of comparison. The antigens were aqueous extracts of the Reed and Rice *S* and *R* cultures of tubercle bacilli. The reactions were read by comparison with a color-scale, which detected differences of at least 5 per cent in the amount of haemolysis. Each serum was tested five times with many dilutions of pooled complement. The total fixation was corrected by subtracting the average amount of fixation with normal serum and the same antigen. In order to facilitate comparison of results with the two antigens, the specific fixation value obtained with the *S* antigen is divided by the fixation value obtained with the *R* antigen. This is styled the *S/R* antibody index of the serum. An immune serum prepared by immunization with pure *S* culture was found in previous experiments to give an index of approximately 2.0 and a pure anti-*R* serum an index of 1.2 or less. The blood sera from approximately 100 cases of pulmonary tuberculosis, whose sputum was positive for tubercle bacilli at the time the samples of blood were taken, were tested by the procedures outlined. These cases were selected from a larger series, with a view to securing a group as widely diversified as possible; some had only recently developed the tuberculous infection, in others it was of many years duration; in some the lesions were minimal, in the majority they were far advanced and extensive; some were described as acutely progressive, some as stationary and chronic; some were making satisfactory improvement. The results with the two antigens are reported from the point of view of the duration of the infection, the extent of the lesions, and the activity of the tuberculous process. *1: Duration of infection:* The cases were arranged in groups ranging from one year or less to five to ten years with a final group of over ten years. The average *S/R* index (1.62) was higher in the one- to two-year group and about the same (1.37 to 1.44) in all the other groups, with the exception of the cases of more than ten years' duration which gave an index (1.24), characteristic of the standard *R* immune serum. *2: Extent of the lesions:* Twenty-eight cases with extensive lesions and 22 cases with moderate tissue involvement gave essentially the same indices. *3: The activity of the lesion:* The average index for the acute group was 1.73, for the intermediate group approximately 1.5 and for the chronic group 1.22. A high index apparently characterizes acute cases, a low index chronic cases. *Summary:* All tuberculous sera do not react equally with carefully tested antigens prepared from *S* and *R* cultures of human tubercle bacilli. These two antigens are about equally efficient in detecting the complement-fixing antibodies in sera from cases of the chronic type, but the *S* antigen fixes specifically, in the presence of serum from the majority of acute cases, twice as much or more complement than is fixed by the *R* antigen. Sera from cases of the intermediate type usually fall between these extremes.—*Complement-Fixation with S and R antigens and the Sera of 100 Cases of Tuberculosis, E. Rice, J. H. Orr and G. B. Reed, J. Immunol., July, 1933, xxv, 19.*—(*J. S. W.*).

Flocculation Reaction in Pulmonary Tuberculosis.—The reaction of Dujarric de la Rivière requires *1:* The methylated antigen of Boquet and Nègre prepared as follows: A six weeks' broth-culture of mixed human and bovine bacilli is sterilized by heating at 120° for 30 minutes, filtered, washed with distilled water, dried at 37°, extracted with acetone (1 cc. for each gram of bacilli) for 24 hours, dried again, then macerated in pure methyl alcohol (1 cc. for each gram of bacilli) for 12 days at 37°, and finally filtered, the filtrate being the antigen. *2:* A 10 per cent tincture of gum-resin in methyl alcohol. To perform the test 5 parts of the methylated antigen are mixed with 1 part of the gum-resin tincture, and 0.1 cc. of this mixture dissolved in 5 cc. of normal saline solution. This solution becomes opalescent on shaking. On adding 1 cc. of normal serum plus one drop of a 10 per cent aqueous solution of acetic acid, the opalescence clears, while the addition of serum from tuberculous individuals intensifies the opalescence. This test was performed 53 times in 31 cases of pulmonary tuberculosis. The test was positive in each instance, roughly paralleled in intensity to the activity of the disease, and reflected its progression or regression. The Vernes flocculation test was simultaneously performed in each instance. Although, on the whole, the results agreed, discrepancies appeared. The Vernes test, being photometric, permitted greater insight into the finer nuances of the pathological process, and reflected the clinical state more accurately. Possibly also, the tests are based on different factors in the changed colloidal complex of the tuberculous serum. In animal research, utilizing both

rabbits and guinea pigs, the two tests paralleled each other more closely. All the healthy animals yielded consistently negative results. Following intravenous inoculation the gum-resin-methylated-antigen test responded earlier than the Vernes test. Since the introduction of killed bacilli did not subsequently evoke the flocculation, apparently the mere penetration of the body by bacilli is not the causal nexus, but rather the pathological tissue changes, most probably the caseous ones that result.—*La réaction de floculation antigéne méthylique-teinture de gomme-gutte dans la tuberculose pulmonaire, J. Caussimon, Rev. d. l. Tuberc., December, 1932, xiii, 1001.*—(*A. E. M.*)

Value of Vernes' Flocculation Test.—This investigation was undertaken, despite the already voluminous work reported on this test, because of the great importance attributed to it by French physicians. The test was performed according to Vernes' directions in 355 cases of pulmonary tuberculosis of various stages and in 463 cases of nontuberculous disorders of various types. Since 208 of these latter yielded positive results, it is concluded that this test has no diagnostic value at all in tuberculosis. However, it is reaffirmed that it is useful in determining the degree of activity of tuberculous lesions. Particularly when serial tests are done is it apparent that in the great majority of cases the reaction parallels the course of the disease, and hence has both some prognostic value and may be used to control the efficacy of therapeutic procedures.—*Valeur de la réaction de Vernes à la résorcine dans la tuberculose pulmonaire, Nadzieja Berdo, Rev. d. l. Tuberc., February, 1933, i, 149.*—(*A. E. M.*)

Perifocal Red-Cell Sedimentation Rate.—The sedimentation rate in specimens of blood taken from the finger and from the immediate neighborhood of bone-and-joint lesions was compared. The rate of these two specimens from the same patient may differ considerably. In patients with closed lesions the sedimentation rate of the perifocal blood is lower than that of the peripheral blood. The opposite is found in patients with mixed infection. When the difference between the two specimens diminishes while the absolute rate diminishes the prognosis is favorable.—*Perifokale Erythrocytensenkungsreaktion, M. M. Altschuler, Beitr. z. Klin. d. Tuberk., June 24, 1933, lxxxiii, 35.*—(*M. P.*)

Tuberculosis of Eye.—The two major problems with which the oculist is at present concerned are chronic endogenous uveitis and phlyctenular keratoconjunctivitis. The aetiology of many pathological conditions of the eye is still obscure. The cases of undoubtedly tuberculous origin are comparatively rare in proportion to the frequency of tuberculous infection. It can be assumed that uveitis is due to a haematogenous spread, even though the close relationship to the systemic infection is obvious only in a few instances, such as miliary tuberculosis with choroidaltubercles, certain cases of iritis, and the so-called conglomerate tubercles of the choroid. With the existing antagonism between tuberculosis of the lungs and that of other organs, physical examination is as a rule of little value for differential diagnosis. Radiograms reveal in many cases old apparently healed lesions, such as calcified lymph nodes or pleural adhesions, which are suggestive of tuberculosis as an aetiological factor in ophthalmic disease, but are not to be considered conclusive. Of greater significance are the diagnostic tuberculin tests and the therapeutic effects of specific treatment. Sharp local reaction to minimal doses of tuberculin are frequently seen. Focal reactions in the absence of general reactions point to tuberculosis, because changes around the focus in the eye which are associated with systemic symptoms can be caused by nonspecific irritation. The demonstration of tubercle bacilli in excised tissues, or by culture or animal passage would be convincing proof, but it has not been successful in a number of conditions of questionable origin. Cultures from the circulating blood with Loewenstein's method have been reported positive in a few cases of uveitis, but the results so far have been too conflicting to draw diagnostic conclusions. In none of the 18 cases of uveitis under observation could positive cultures be obtained with Loewenstein's culture medium and technique. While the tuberculous nature of many types of uveitis is thus still a matter of conjecture the close relationship of phlyctenular disease to tuberculosis is more firmly established. The absence of tubercle bacilli in excised tissues, the high degree of hypersensitiveness to tuberculin which was found in the earliest age-groups and the appearance of vesicles following the formerly used ophthalmoreaction support the current views that phlyctenular disease is a tuberculotoxic phenomenon due to an antigen-antibody reaction. Retina and optic nerve are rarely the seat of tuberculous changes. The tuberculous origin of the characteristic *periphlebitis retinae* is however generally accepted; histologically a typical tuberculous structure with giant cells has been found in such cases.—*In welchem Umfang darf bei Erkrankungen des Auges*

tuberkulöse Aetiologie heute als sichergestellt gelten? O. Marchesani, Klin. Wchnschr., November 12, 1932, xl, 1921.—(K. F.)

Phlyctenular Disease.—Tuberculosis is the chief cause of phlyctenular keratoconjunctivitis in children. The tuberculin reaction is positive in from 90 to 95 per cent. Of the 24 children studied only one showed frank clinical evidences of tuberculosis. Eight others, however, had indisputable X-ray findings of pulmonary tuberculosis. More than 25 per cent of the children were living in tuberculous surroundings. The prognosis in children with phlyctenular disease is, in general, favorable. Roentgenography of the chest is imperative in every case. Removal from infectious contacts as a precaution against serious reinfection is advisable.—*Il faut radiographier le thorax des enfants porteurs de kérato-conjunctivite phlycténulaire, Pierret, Breton and Loison, Arch. Méd. Enf., 1933, xxxvi, 393.—(M. D.)*

Cervical Lymphadenitis.—The diminished incidence of enlarged cervical lymph nodes in the past twenty years is attributable to regular examination of school-children and to improved methods of treating infected teeth and septic conditions of the nose and throat. A series of cases, in which radical operations were done for the removal of tuberculous cervical nodes during the years 1923 to 1932 inclusive, is analyzed. In 97 of the 161 cases analyzed, the "tonsillar" node chiefly was affected, and in 43 others the nodes of the anterior triangle were diseased, with the probability that the infection had come through the tonsil. The preoperative duration of adenitis was over one year in 25 per cent, and over two years in 59 per cent of the 161 cases. Usually the onset was attributed to sore throat, often affecting an entire family. Frequently the nodes enlarged following the sore throat, subsided, and then after several months enlarged again. Apparently a septic infection predisposes the node to an attack by tubercle bacilli. All nodes removed were found tuberculous; only in two was there found an added infection (streptococcic). A tuberculous lymph node appears as a firm, elastic swelling, usually in the digastric triangle, elongated, fairly movable, not tender, with seedlings palpable below the node in the anterior triangle and under the sternomastoid extending to the posterior triangle. Infants may react acutely, with a brawny mass in the neck. Caseation and liquefaction are an insidious process. Obvious fluctuation usually indicates an abscess outside of the node. Swelling which becomes more evident, often described as "dropping" of the node, usually indicates perforation of the deep fascial envelope and formation of a subcutaneous abscess. Treatment, to be efficient, should begin before infection has pierced the capsule of the node. With proper treatment prognosis is good except in infants. Two of the patients described, infants, died of tuberculous meningitis following curettage of acute cervical abscesses. All sources of infection should be eliminated as soon as enlargement of the nodes appears. Rest is important, and varies from regular rest periods and avoidance of games to strict bed-rest with splint immobilization of the neck. General exposure of the body to the sun is of value, but usually is insufficient for cure. Nodes of such size as are unlikely to resolve, persisting under conservative treatment or showing any sign of softening should be removed by dissection. An abscess does not contraindicate this treatment. Of the 161 cases so treated, 46 per cent had abscesses outside of the nodes before operation and 13 per cent had sinuses, but the majority healed by first intention. The only postoperative complication was wasting of the upper trapezius due to injury of the spinal accessory or the third and fourth cervical nerves in the posterior triangle.—*Tuberculous Glands of the Neck, L. E. Barrington-Ward, Lancet, June 3, 1933, ccxxiv, 1193.—(R. M. F.)*

Generalized Tuberculous Lymphadenitis.—Although generalized lymph-node tuberculosis occurs in adults as well as in children, associated pulmonary disease is a usual feature. In fact, careful bibliographic research reveals that only 6 cases of tuberculosis limited exclusively to the lymphatic system have been reported. A seventh such case is here presented. A twenty-two-year-old female sought medical attention because of fatigability, anorexia, loss of weight, and nervousness. Physical examination revealed only a generalized lymphadenitis. Biopsy proved the tuberculous nexus. Roentgenograms showed that most of the enlarged lymph-nodes were calcified, and that the pulmonary parenchyma was uninvolved. The case was followed for three years and treated by general measures and X-ray with ultimate good results, although several acute exacerbations with lymph-node suppuration and fistulization occurred. The elective localization of the tubercle bacillus is an as yet unsolved problem, the strain of infecting organism, decreased specific tissue resistance, and route of infection each probably playing a part. Unfortunately, in this case the type of tubercle bacillus involved was not ascertained. It is concluded that in a generalized lymphadenopathy without other organic involvement, whether acute or

chronic, whatever the clinical course or findings, tuberculosis should always be considered.—*Tuberculose ganglionnaire a localisations multiples avec calcifications consécutives des foyers, J. V. Grott, M. Zaleski and R. Sztajer, Rev. d. l. Tuberc., November, 1932, xiii, 906.*—(*A. E. M.*)

Pulmonary and Lymphatic Tuberculosis.—In a review of 58 cases of pulmonary complicating lymphatic tuberculosis, a good prognosis is given in only 6 cases. The sex of the patient and the onset of the lymphatic lesion appear to have no influence on prognosis. Statistics suggest that surgical intervention in lymphatic tuberculosis does not have a beneficial influence in preventing a subsequent pulmonary lesion or in determining a more benign type of pulmonary lesion. The prognosis is very bad if the pulmonary lesion appears before the age of 20, improves somewhat if it does not appear until the third decade, and becomes more grave again after the age of 30. In 41 of the cases the pulmonary lesion was of apical type. There was a tendency toward cavitation and the sputum was rather copious and positive for tubercle bacilli. Apparently when the lesion is of the root-spread type the prognosis is better than when it is apical or miliary in its distribution. In 38 cases in the series the lymphatic lesion occurred before the age of sixteen. Bovine bacilli were isolated in only 8 of these cases. This raises the question of the possibility of a double infection.—*Pulmonary Tuberculosis Complicating Glandular Tuberculosis, W. M. Cumming, Tubercle, March, 1933, xiv, 259.*—(*T. O. R.*)

Tuberculous Laryngitis.—Left to itself without rational therapy, the prognosis of tuberculous laryngitis is usually bad. Early diagnosis is important and necessary. Every tuberculosis patient should have frequent and repeated laryngoscopic examinations. The upper air-passages should be investigated more often also. Only in this way can the earliest forms of tuberculous disease of the larynx be recognized and treated with early and brilliant results. Proper treatment of the pulmonary lesion is of course necessary, and should be carried out in sanatoria with facilities for proper laryngeal examination by the laryngologist. He alone can determine the proper therapeutic procedure since there is no definite treatment for each form of laryngitis. The galvanocautery is a highly practical method of treatment, and may be used in most cases with outstanding improvement and may even lead to a perfect anatomical cure. Mountain climate is indicated in cases with early or incipient laryngeal disease. Close supervision and frequent examination is important in this group. A course of treatment in a mountain climate is also of great help in patients whose laryngeal tuberculosis has already been treated with more radical measures. Incurable cases are made worse by residence in dry climate.—*Tubercolosi laryngea e sanatorio di montagna in rapporto ad alcuni casi curati con galvano caustica, O. Gianni, La lotta contro la tubercolosi, November, 1932, iii, 1186.*—(*U. E. Z.*)

Heliotherapy in Laryngeal Tuberculosis.—Because of the scarcity of sunlight in England, only artificial heliotherapy is discussed. Laryngeal tuberculosis has been reported as occurring in from 8 per cent to 80 per cent of all cases of pulmonary tuberculosis. St. Clair Thomson's follow-up of patients for from one to ten years after their discharge showed that the death-rate of those with laryngitis was twice that of patients without laryngitis. He obtained cures in 119, or 25 per cent, of 477 cases of laryngeal tuberculosis by the use of a combination of "whisper" and the galvanocautery. Strandberg prefers general artificial-light baths to local application of light to the larynx, because by the latter method very small quantities of light reach the larynx and the irradiation of surrounding tissues may cause undesirable reactions. He uses carbon-arc lamps which require a current of 55 volts, and in which the lower carbons are as thin as possible. Ambulant patients are treated by a 75-ampere, and bed patients by a 20-ampere type of lamp. Daily baths of five minutes' duration are gradually increased to a maximum of two and one-half hours. Of 203 out-patients thus treated at the Finsen Institute, Strandberg secured clinical cures of the laryngitis in 113 or, 55.6 per cent. Though the sexes were represented in the proportion of 3 women to 2 men, the recovery rate for women was almost 50 per cent higher than that for men; probably because the men continued to work and came later for treatment. Strandberg reported healing in 84 per cent of 69 sanatorium patients treated by his method. He also uses surgical measures, such as excisions and the galvanocautery. St. Clair Thomson duplicated Strandberg's method in treating a group of 32 sanatorium cases during a period of three years, and, though cures resulted in 24, or 75 per cent, of the cases, he concluded that there was no striking evidence of benefit from the light treatment. He claimed that a cure can be effected by galvanocautery in 64 per cent of cases. Advocates of application of light to the larynx are Cemach, who uses a quartz-mercury-vapor lamp, and Wessely, who em-

ploys a carbon-arc lamp of special design. Cemach reported cures in 48 per cent of 35 cases by application of the light through a speculum. He also advocates the use of a sickle-shaped mercury-quartz tube applied directly to the lesion, but gives no statistics of his results with this method. Wessely uses metallic carbons in a special lamp, which concentrates the rays in a narrow cone and applies the light by either direct or indirect laryngoscopy, using a steel mirror in the latter case. Cures by this method are claimed in one-third of cases by Wessely and in 79 per cent of cases by Miller. Glenn and McGinnis claim improvement in 89 per cent of 77 cases after the local application of light from a quartz lamp. It is concluded that heliotherapy may be useful as a preparation for measures such as galvanocauterization, but that use of light alone is too costly and requires too much time and patience.—*The Treatment of Laryngeal Tuberculosis by Light: a Review of Methods and Results, E. A. Underwood, Brit. J. Tuberc., July, 1933, xxvii, 104.*—(*R. M. F.*)

Apical Pleuritis.—In the absence of pleural adhesions, even a small pleural exudate may be spread over the entire surface of the lung. In those places in which respiratory motion is least vigorous, that is, over the apex and over the mediastinal surface, pleuritic adhesions may be formed. Such adhesions may, particularly if the exudate contains few bacilli, heal in the form of noncharacteristic scar-tissue. This mechanism explains the frequent occurrence of pleural caps without any underlying parenchymal disease.—*Fernpleuritis und ihre Beziehungen zu Schwielen im Lungenspitzengebiet, A. Albert, Beitr. z. Klin. d. Tuberk., May 22, 1933, lxxxii, 776.*—(*M. P.*)

Tuberculous Empyema.—For practical purposes it is important to differentiate between primary and secondary tuberculous empyema, since in the former the ultimate aim of treatment is to achieve reëxpansion of the lung, and in the latter collapse of the lung. It may well be true that such an entity as primary tuberculous empyema does not exist, but, practically, a tuberculous empyema may be termed "primary" if there has been no previous evidence of pulmonary tuberculosis and if there is no sputum with tubercle bacilli, or if the empyema quickly follows a primary serous effusion. Secondary infection is common in tuberculous empyema, occurring in 92 of the 146 cases included in this report, but these superimposed pyogenic infections are not necessarily severe. Among the causes of secondary infection of tuberculous empyema are injudicious drainage, perforation of a tuberculous cavity, and infection of the empyema from a chest-wall sinus caused by aspiration of the empyema cavity. Direct examination of the pus will readily tell whether or not one is dealing with a secondarily infected empyema; the absence of pyogenic organisms enables one to assume that the empyema is tuberculous. The existence of a bronchial fistula can be proved by injecting a dye into the pleural space and noting the color in the expectorated pus. In a primary tuberculous empyema without secondary infection, treatment consists of the repeated aspiration of pus and replacement with air, always leaving the pressure at slightly less than atmospheric. Failure after some months of such treatment to cure the empyema is an indication for thoracoplasty. If secondarily infected, closed drainage is indicated with irrigation with Dakin's solution, provided there is no bronchial fistula; in the presence of a large bronchial fistula, open drainage may be needed. Often a thoracoplasty or a plastic operation will be necessary for complete healing, since the lung often reëxpands only in part. In secondary tuberculous empyema, including those resulting from artificial pneumothorax, the treatment of choice is early thoracoplasty, both to obliterate the empyema cavity as well as to aid the healing of the underlying pulmonary lesion. If secondary infection occurs, it may be mild and may be disregarded; if severe, drainage is indicated, of the closed type with saline irrigations if possible, although open drainage may be needed if a large bronchial fistula exists. A combined posterior and anterolateral thoracoplasty is often needed to close a large empyema cavity; and excision of the parietal pleura over the cavity may be necessary. In this series of 146 cases, 82 were treated by radical surgical measures. Of this group, 23 had no secondary infection and the cavity was obliterated in 18; there were no deaths in this group. Of the 59 cases with secondary infection, obliteration of the cavity was obtained in 38, but a persistent sinus remained in 19. Twenty per cent of this group with secondary infection died. The 61 cases treated with only irrigation and drainage showed a higher mortality, 32.1 per cent in the group with sterile fluid and 39.4 per cent of those that were secondarily infected; and the cavities were closed in only 9 of the 61 cases. In comparing these two modes of treatment it must be remembered that many patients in the latter group were in too poor condition to allow radical surgical treatment. Death in tuberculous empyema cases is due mostly to the underlying pulmonary lesion and to the presence of severe secondary infection.—

The Surgical Treatment of Tuberculous Empyaema, C. A. Hedbloom, J. Thorac. Surg., December, 1932, ii, 115.—(*B. B.*)

Tuberculous Pyopneumothorax.—According to Archibald, the ideal treatment for tuberculous pyopneumothorax, not complicated by secondary infection, is early thoracoplasty, provided that the condition of the contralateral lung permits. If delayed, pyogenic infection may occur by one of several pathways, and the situation immediately becomes much more serious. In those cases with pyogenic infection one of the important considerations in determining therapy is the presence or absence of a bronchial fistula. When the latter is not present, aspiration and lavage with 0.1 per cent gentian-violet solution, followed by the instillation of 20 cc. of a 1.0 per cent solution, repeated at frequent intervals, will usually rid the pus of pyogenic organisms. Pneumothorax or oleothorax can later be instituted; on the other hand, this is the ideal time for thoracoplasty, and to temporize by continuing pneumothorax or oleothorax may prove dangerous. If such aspiration and lavage do not produce improvement within a week, thoracotomy, at first closed, then open, is indicated, to be followed by a thoracoplasty. In the presence of a bronchial fistula immediate drainage is indicated, either closed or with rib-resection; as soon as the patient's condition permits, thoracoplasty should be done. In a group of 75 cases of tuberculous pyopneumothorax complicated by pyogenic infections, 42 patients are dead and 15 were cured. In the latter group were 4 cases, without demonstrable bronchopleural fistula, cured by aspiration and lavage. Four patients of the "cured" group wear small tubes.—*Tuberculous Pyopneumothorax with Pyogenic Infections, F. B. Berry, J. Thorac. Surg., December, 1932, ii, 139.*—(*B. B.*)

Tuberculous Pericarditis.—In the years 1911 to 1931, 15,059 autopsies were performed in the Pathological Institute of the University of Heidelberg. Among these 130 (0.9 per cent) showed tuberculous pericarditis, which represented 5 per cent of all patients dying of tuberculosis. Of the 130 cases with tuberculous pericarditis, 12 per cent were miliary, predominantly productive types, and 88 per cent were exudative. Fifteen to 20 per cent were caused by continuity from tuberculous lymph nodes or from the pleura, 45 to 50 per cent originated by lymphatic spread from lymph nodes, lung or pleura, and 35 per cent were haematogenous. The lesion was twice as frequent in men as in women. It occurred with approximately equal frequency in all age-groups.—*Über Pericarditis tuberculosa unter Berücksichtigung des Infektionsweges, bearbeitet nach dem Sektionsmaterial des Pathologischen Instituts Heidelberg, E. Keller, Beitr. z. Klin. d. Tuberk., February, 1933, lxxxii, 213.*—(*M. P.*)

Tuberculous Pericarditis.—Tuberculosis of the pericardium may be divided into four main groups: (1) the tuberculous pericarditis may be part of a generalized tuberculous process; (2) it may be associated with tuberculous polyserositis; (3) it may result from direct extension and rupture of adjacent tuberculous foci; and (4) it may, as far as one can judge at autopsy, be either the only or the oldest tuberculous lesion. The last group is known as primary tuberculous pericarditis. The author lists 28 cases of primary tuberculosis of the pericardium, including 7 cases studied personally, which present a uniform and characteristic clinical picture. This clinical picture is apparently so constant that it would seem that a correct antemortem diagnosis should be made in the majority of cases. Diagnostic points that occur with striking regularity are: *1:* The age of the patients is well advanced, the youngest in the series being 49, the oldest 84, and the average 69.5 years. *2:* The onset is insidious, and occurs in patients without previous history of cardiac symptoms or evidence of previous rheumatic fever, syphilis or arteriosclerotic heart disease. *3:* There is a presence of unexplained fever in all cases. *4:* There is a rapidly progressive increase in the symptoms of cardiac insufficiency proceeding relentlessly to a fatal termination within a very few months of the appearance of the first symptom.—*Primary Tuberculosis of the Pericardium, W. P. Thompson, J. Am. M. Ass., March 4, 1933, c, 642.*—(*G. L. L.*)

Tuberculous Pericardial Effusion.—A man, 20 years old, had repeated attacks of vomiting and pain in the right side of his abdomen for one year. Then he was seriously ill for two months with fever, abdominal pain and swelling, emaciation, and swelling of his right arm and leg. He recovered rapidly, but five months later developed dyspnoea and cough, with sputum containing tubercle bacilli. One year later he was hospitalized. He was then well nourished, but had slight cough with scanty expectoration and his lips and fingers were cyanosed. His fingers were clubbed. His abdomen apparently was normal. An area of dulness extended from the left midclavicular line to the right posterior axillary line and from the 2nd costal cartilages to merge with the area of liver dulness. The cardiac impulse could not be defined and the heart-sounds were muffled. The apices of both lungs were dull and fine

râles were heard over the left. Roentgen-ray study revealed a fine mottling throughout the lungs, most dense in the left upper lobe. A dense spherical shadow extended from the left midclavicular line to the right axilla and from the aorta to the diaphragm. The condition was thought to be pericardial effusion, or hydatid or dermoid cyst. (The differential diagnosis is discussed.) Five centimetres of the right 4th costal cartilage were removed under local anaesthesia, the pericardial sac was incised, and 2 litres of cloudy yellow fluid were withdrawn. The sac was washed with salt solution and the incisions were closed without drainage. A few acid-fast bacilli were found in the fluid, though it produced no growth on culture. Roentgen-ray study revealed a hydropneumopericardium and the extent of the sac was the same as before aspiration of fluid. The heart was in the midline and of normal size, but apparently was rotated on its longitudinal axis. The cyanosis and the clubbing of the fingers diminished and the patient became active, though the effusion reaccumulated. The sequence of events would appear to have been a slow onset of abdominal tubercle, later becoming severe, with a haematogenous spread of tubercle bacilli to the lungs and pericardium.—*A Case of Tuberculous Pericardial Effusion, A. Adams and F. S. Hawkins, Lancet, July 1, 1933, ccxxv, 12.*—(*R. M. F.*)

Tuberculous Mesarteritis.—The first record of aneurysm as a result of the invasion of the vessel-wall by tubercle bacilli was by Kamen in 1895. Since this first report 20 cases of aneurysm of medium-sized and large arteries have been reported in the literature. In only four of these 20 cases, however, was this tuberculous arteritis due wholly to the haematogenous dissemination of bacilli, with the lodgment of tubercle bacilli, in the media of the vessel-wall, having passed through the vasa vasorum. In this, a fifth report, a male aged 53, had a painful swelling on the inner surface of the leg above the knee, the onset of symptoms having occurred two years previously. The swelling had become progressively larger (about 7.5 cm. in diameter), with pain radiating to the knee and calf, and showing an irritation of the periosteum of the femur so that a diagnosis of osteomyelitis was made roentgenologically. At operation an aneurysm of the femoral artery was found to have ruptured, and caused a haematoma. That this was an example of tuberculous arteritis, as a result of the spread of tubercle bacilli through the vasa vasorum, was unquestionably shown by the localization of the process primarily in the media and the complete absence of any tuberculous process in the tissue sectioned about the artery. Tuberculous arteritis as an aetiological factor in aneurysm is relatively rare. Of the 5 cases reported as a result of transmission through the vasa vasorum, in four the femoral artery was involved. A primary focus of tuberculosis was not discovered in the authors' patient.—*Tuberculous Mesarteritis with Aneurysm of the Femoral Artery, E. C. Baumgarten and M. O. Cantor, J. Am. M. Ass., June 17, 1933, c, 1918.*—(*G. L. L.*)

Intestinal Tuberculosis.—The most important data of our present knowlegde of intestinal tuberculosis are reviewed. The first site of tuberculous ulceration of the intestines is the ileocaecal region in 85 per cent of cases, whether the bacilli are introduced by ingestion or haematogenously. Most intestinal tuberculosis is caused by ingested bacilli. They first attack lymphoid tissue, which is most abundant in the terminal ileum. Infection is aided by the normal stasis in the ileocaecal region and by irritation of the mucosa by constipation. Tubercle bacilli can penetrate normal mucosa without producing lesions. The disease begins in the submucous lymph-tissue and causes ulceration by direct extension. Though intestinal tuberculosis occurs in the absence of pulmonary cavitation, it is more frequent if cavity is present, and the amount of enteritis is directly proportional to the degree of activity in the lungs. Tuberculous intestinal ulcers are not found in cases of acute tuberculous pneumonia and of old fibroid pulmonary tuberculosis. The chief criteria for the diagnosis of intestinal tuberculosis by roentgen-ray study are general hypermotility, failure of the caecum and ascending colon to retain barium, the presence of spasm and the absence of haustrations in the ascending colon, segmentation of the coils of the small intestine, ileal stasis and gastric retention. Certain of these signs may be present without intestinal symptoms and usually all signs disappear with healing. Symptoms suggestive of intestinal tuberculosis are a slight rise of temperature without an increase of pulmonary symptoms, failure of patients with chronic pulmonary tuberculosis to gain weight, digestive disturbances, abdominal discomfort, nervousness, and constipation or constipation alternating with diarrhoea. Tuberculous lesions of the alimentary tract have a greater tendency to spontaneous healing than pulmonary lesions. The first essential in treatment is to stop infection by ingested sputum through control of the pulmonary lesions. Controlled heliotherapy with avoidance of local and general reactions results in definite improvement in about two-thirds of all cases treated. Early

treatment gives the best results. McConkey found that a high-vitamine diet of one-half ounce of codliver oil and three ounces of tomato juice three times daily has given better results than artificial heliotherapy. Intravenous injection of calcium chloride gives immediate relief of pain and diarrhoea. A low-residue diet should be used. Foods causing fermentation should be avoided. Often the act of eating, independently of the nature of the food taken, sets up peristalsis in the colon and terminal ileum when the bowel is irritable. Surgery of the intestines may be indicated if ulceration is limited to a small area, and is always indicated for localized hyperplastic caecal tuberculosis. Prevention of intestinal tuberculosis depends upon the early and successful treatment of pulmonary tuberculosis. Constipation should be prevented. The high-vitamine diet is recommended for all patients with pulmonary tuberculosis.—*Intestinal Tuberculosis, Early Diagnosis, Treatment, and Prevention, A. I. G. McLaughlin, Lancet, June 24, 1933, ccxxiv, 1333.*—(*R. M. F.*)

Treatment of Intestinal Tuberculosis by Pneumoperitoneum.—In 21 patients with far-advanced intestinal tuberculosis, pneumoperitoneum was established and maintained over a considerable time. Practically all the annoying symptoms of the disease disappeared, but the diarrhoea was influenced less than any of the other symptoms. In one patient who had a prognostically favorable pulmonary tuberculosis but a far-advanced intestinal tuberculosis, the pneumoperitoneum improved the latter and the general condition to a sufficient extent to permit a large intestinal resection. This treatment was followed by marked improvement.—*Das Pneumoperitoneum als Behandlungsmethode der Darmtuberkulose, R. Klopstock and W. Schüler, Beitr. z. Klin. d. Tuberk., June 24, 1933, lxxxiii, 1.*—(*M. P.*)

Primary Tuberculosis of Spleen.—Primary tuberculosis of the spleen implies the localization of disease to the spleen after the primary focus failed to develop gross pathological change or after it had healed. The splenic lesion usually runs a chronic course, and causes symptoms of general toxaemia and local inflammation. From it, tubercle bacilli may be disseminated. In the previously reported 50 or 60 cases, the diagnosis has seldom been made before operation or autopsy. The blood-picture is inconstant. The spleen may or may not be enlarged. Several patients have been operated upon for Banti's disease. The disease is chronic and all patients show evidence of substandard strength and health. In all 3 cases in this report the diagnosis was made before operation. Details in these cases show considerable similarity in their long, partially disabling illness, acute exacerbations, fever and malaise. All three showed roentgenological evidence of calcareous deposits in the spleen, and were middle-aged adults. The splenic artery was found to be small in all cases. It seems fairly certain that by means of a roentgenogram of the splenic area a correct diagnosis can be made in the majority of cases of primary tuberculosis of the spleen.—*Chronic Primary Tuberculosis of the Spleen, H. R. Shands, Am. J. Surg., June, 1933, xx, 707.*—(*J. F. B.*)

Tuberculous Fistula-in-Ano.—Tuberculous fistulae will heal after adequate operation if reasonable care is given to the pulmonary disease. The removal of a suppurative focus benefits the patient; this is especially true if the area of suppuration is fairly large, as it often is in these patients. Toxaemia is reduced, and the patient, made more comfortable, rests better. Fistulectomy carries out one of the cardinal tenets of modern therapy in the disease; namely, the elimination of tuberculous or nontuberculous complications to the healing ability of the pulmonary foci. Of 75 fistulectomies in the last five years 56 per cent of anal fistulae in 55 patients having pulmonary tuberculosis were proved to be tuberculous; while 72 per cent of 20 cases in 1932 were proved tuberculous by more detailed investigation. That something more than 72 per cent are tuberculous is probable. Seven per cent of all pulmonary-tuberculosis cases at the Chicago Municipal Tuberculosis Sanitarium had anal fistulae. The diagnosis of tuberculosis in fistula of the anus and rectum in patients with pulmonary tuberculosis depends entirely on the histopathological examination. In 87 per cent of the patients with pulmonary tuberculosis on whom anal fistulectomy was performed, healing was complete; the remaining 13 per cent were far-advanced cases; despite this fact, healing was progressing in 10.4 per cent of these up to the time of death. In the tuberculosis patient, a perianal abscess should be incised as soon as it is diagnosed. Drainage of the infected area must be maintained. If a sinus or fistula persists, it should be operated on as soon as the general condition permits.—*Tuberculous Fistula in Ano, C. L. Martin, J. Am. M. Ass., July 15, 1933, ci, 201.*—(*G. L. L.*)

Treatment of Surgical Tuberculosis.—The views on the treatment of tuberculosis of lymph nodes, bones and joints have changed radically, inasmuch as the necessity of treating the systemic infection and not

only the localized lesion, which may call for surgery, has been recognized. The latter is always a lymphogenous or haematogenous metastasis, originating from the primary focus in the respiratory or alimentary tract, and a careful examination of all organs and a combination of surgery with other methods of treatment is necessary in order to obtain the best results. Tuberculosis of the lymph nodes is mostly seen in children or adolescents, and requires treatment primarily in the stage of retrogressive changes (caseation or liquefaction with or without mixed infection). Surgery should be limited to a minimum and should always be combined with general hygienic-dietetic measures, heliotherapy, quartz-light treatment and particularly with X-ray irradiation. The latter in repeated small doses is the method of choice. Tuberculosis of the retroperitoneal lymph nodes can cause the most varied symptoms, and presents diagnostic problems which sometimes cannot be cleared up without an exploratory laparotomy, which is advised in these cases. Tuberculosis of bones and joints is slightly more prevalent in males and on the right side. Spine, knee and hip are mostly involved in the order mentioned. According to Clairmont the distribution of tuberculosis in the skeleton and joints is uniform, and the frequency of involvement is proportionate to the size of the affected part. Monolocular lesions are rare, and changes in the lungs or other bones are often found. In Clairmont's material 60 per cent of the patients had pleuropulmonary involvement, and 81 per cent had tuberculosis of more than one organ. Impairment of function is usually the first symptom which is soon followed by local signs. Early diagnosis by a careful general examination and the use of all auxiliary diagnostic methods is most important. The duration can be estimated at from one to four years, but a more chronic course with remissions and exacerbations is not uncommon. The mortality is high (in Clairmont's statistics 26 per cent), the most frequent causes of death being pulmonary or miliary tuberculosis, involvement of the genitourinary and intestinal tracts and amyloidosis. With the exception of minor surgical procedures which are often necessary to relieve pain, conservative treatment is strictly indicated. Local functional rest, heliotherapy which can be successfully applied in any altitude and a salt-free diet give excellent results.—*Zur Therapie der chirurgischen Tuberkulose, F. Starlinger, Wien. klin. Wchnschr., March 10, 1933, xlvi, 304.*—(*K. F.*)

Treatment of Surgical Tuberculosis with Methylated Antigen.—Five years of therapeutic experience with the methylated antigen of Boquet and Nègre in so-called surgical tuberculosis are reported. The antigen was administered as follows: (1) direct application to fistulae and superficial lesions by compresses or instillations; (2) subcutaneous injections in increasing doses; (3) either of these combined with ultraviolet irradiation. A total of 59 cases were so treated, of which 21 representative ones are breifly outlined. The experience of the series merits the following conclusions: The possibility of success in antigen therapy is a function of the localization, extent and intensity of the lesion. It accomplishes little or nothing in extensive, profound lesions, such as Pott's disease, but may be very efficacious in adenitis, for example, or similar easily accessible, localized superficial lesions. Increased suppuration following administration of the antigen is a favorable phenomenon; its absence warrants discontinuing the treatment as useless. Although there is little actual danger in this therapeutic agent under careful surveillance, close observation is indispensable, inasmuch as certain serious phenomena, such as headache, hyperthermia, urticaria, etc., may occur as is illustrated in two cases. Antigen therapy was never used in place of any orthopaedic, hygienic or other standard procedure, but always as an adjunct. In general, of the 59 cases, 18 resulted in cure, 20 were ameliorated, 4 were aggravated, and the others not affected.—*Traitement des tuberculoses chirurgicales par l'antigène Méthylique, B. Blankoff, Rev. d.l. Tuberc., March, 1933, i, 268.*—(*A. E. M.*)

Treatment of Surgical Tuberculosis with Splenic Extract.—Local conditions have made the use of raw calf milk diet quite impracticable although an adjuvant which might hasten healing has been sought. Fresh frozen spleens are thawed out, extracted in water, the coagulable proteins and fibres removed, and the aqueous fraction evaporated to a paste *in vacuo*. The paste has the consistence of thick condensed soup. One ounce represents approximately one pound of raw spleen. One teaspoonful of the paste is given three times daily for a week, and then the dose is increased to one tablespoonful. The dosage has not varied and eventually all patients have been able to take it, although several ways of feeding it have been employed. All cases have been kept on this routine continuously. The results in 17 cases, in which treatment has been continued for a year, are reported. It is felt that the use of the extract has been very beneficial, improvement has been noted in the febrile condition, local reactions, growth, weight, color, appetite, blood, deformity and compli-

cations. There is also some evidence that improvement may be expected in osteomyelitis and in ununited fractures. The improvement gained by the use of splenic extract cannot yet be explained, but studies to determine the most important factors are being made.—*Splenic Extract Treatment of Bone and Joint Tuberculosis, T. F. Wheeldon, J. Bone & Joint Surg., April, 1933, xv, 337.—(J. F. B.)*

Treatment of Surgical Tuberculosis with *Catalsan*.—Catalsan an abiuret filterable tuberculin (Tomarkin) was used in 33 cases of bone-and-joint tuberculosis, of which eleven were not appraised because of the brief duration of treatment. In 3 cases the treatment was poorly tolerated, causing progression of the disease, and had to be discontinued. In 2 cases the temperature was favorably influenced. In other cases it exerted no influence of any kind. On the whole, *Catalsan* is a well-tolerated agent in treatment and deserves further trial as a nonspecific stimulant in tuberculosis.—*Erfahrungen mit Catalsanbehandlung bei chirurgischer Tuberkulose, F. L. Dumont, Ztschr. f. Tuberk., 1932, lxvi, 108.—(H. J. C.)*

Tuberculous Cripple.—The incidence of nonpulmonary tuberculosis shows little decrease. A lack of proper supervision of cases of bone-and-joint tuberculosis after their discharge from the orthopaedic hospital results in dissemination of the disease, often fatal, local recurrence of activity, or increasing deformity, necessitating readmission. To avoid this, districts should be formed, each with its central orthopaedic hospital, so that observation after discharge can be carried out in a chain of clinics. Early diagnosis and notification of suspected cases of tuberculosis are important, especially in children. Purely conservative treatment by immobilization in the open air is necessary in every case of bone-and-joint tuberculosis, and is usually sufficient if the disease is limited to the synovial membranes, but, when there is much destruction of bone, surgery is indispensable. Its aim is to eliminate tuberculous material and bring raw bone surfaces into close apposition and to promote osteogenesis by bone-grafting, either extraärticular or at a distance. The younger the patient the more likely are conservative methods to succeed. Surgery is most often indicated in childhood in hip-disease. In adults bone-and-joint tuberculosis tends to recur and advance insidiously, and radical surgery is necessary, even to amputation, especially in patients past the third decade.—*The Tuberculous Cripple, W. B. Foley, Brit. J. Tuberc., July, 1933, xxvii, 126.—(R. M. F.)*

Diagnosis of Tuberculous Arthritis.—Tuberculous arthritis may be primary in either synovia or bone. A small primary focus in a bone may extend to the joint, and set up tuberculous arthritis without being detectable in roentgenograms of the joint. Primary synovial tuberculosis soon spreads from the point of onset diffusely over the lining membrane, producing tuberculous granulation tissue. This tissue then attempts to grow over the free surfaces of articular cartilage and absorb it. Contact of the opposing articular surfaces and motion in the joint tend to prevent overgrowth. If the tuberculous process is relatively mild, the granulation tissue remains alive and continues to overgrow and destroy articular cartilage over long periods of time. If the process is severe, there may be early necrosis of granulation tissue before it has overgrown and produced extensive surface destruction of the articular surface. The roentgen findings in such tuberculous joints at this stage are fairly typical and usually consist in three changes: (1) There is regional atrophy of disuse; (2) there is loss of density of the shadow of articular cortex due to bone absorption by the subchondral granulations; and (3) there is preservation of the cartilage space of the joint. In adults, when the disease is primary in the bone, the focus is usually located in the epiphysis bordering on the joint. The infection soon extends into the joint, producing changes that are identical with those of primary synovial tuberculosis. In young children tuberculous arthritis varies somewhat, pathologically from that in adults. In the larger joints, particularly the knee, with relatively thick articular cartilages, destruction of the noncontracted portions by surface granulations is less complete than in adults.—*Correlation of Pathological and Roentgenological Findings in the Diagnosis of Tuberculous Arthritis, D. B. Phemister and C. H. Hatcher, Am. J. Roentgenol. & Rad. Ther., June, 1933, xxix, 736.—(W. I. W.)*

Diagnosis of Bone-and-Joint Tuberculosis.—This study aimed to emphasize such alterations, seen in the roentgenogram, upon which a diagnosis of bone-and-joint tuberculosis rests. Synovitis, periarticular swelling and bone atrophy are common to all arthritides, and are only corroborative in the diagnosis of tuberculous arthritis. Bone atrophy is usually marked, but its intensity is modified by numerous imponderable factors which complicate diagnosis. Sclerosis and bone production occur in tuberculosis even in the absence of mixed infection. Bone production may be absent where sinuses exist. Diaphyseal tuberculosis in long tubu-

lar bones is rare and, roentgenologically, the diagnosis is impossible. Wedge or cone-shaped lesions are usually tuberculous. "Kissing" sequestra are common in tuberculosis. Narrowing of a joint space which occurs late in an infection, despite associated destructive changes, is strong presumption of the existence of tuberculosis. Complications, such as kyphosis, subluxation and sinus formation, occur in tuberculosis as well as in other arthritides. Roentgenologically the presence of a cold abscess specifically identifies the process as tuberculous.—*Roentgen Diagnosis of Bone and Joint Tuberculosis, M. M. Pomeranz, Am. J. Roentgenol. & Rad. Ther., June, 1933, xxix, 753.*—(*W. I. W.*)

Serum Calcium in Bone-and-Joint Tuberculosis.—In 42 patients with bone-and-joint tuberculosis, the amount of dialyzable and nondialyzable calcium was determined. The nondialyzable calcium decreases with the severity of the disease, while the dialyzable portion behaves in reverse fashion. This alteration may be dependent on the changes in the relative amounts of the serum proteins.—*Studien über die Zustandsformen des Calciums im Serum bei Gelenk-und Knochentuberkulose, N. Okuneff and Sophie Wólowa, Beitr. z. Klin. d. Tuberk., April, 1933, lxxxii, 597.*—(*M. P.*)

Types of Bacilli in Bone-and-Joint Tuberculosis.—Tubercle bacilli were obtained in culture from 81 cases of bone-and-joint tuberculosis from southwest Scotland. The original material was pus aspirated from abscesses, which had formed in connection with a tuberculous bone or joint, except in 3 cases with bone lesions, in which cerebrospinal fluid (2 cases) and empyema pus (1 case) were used. The strains from 54 of the cases were of the human type, while from the remaining 27 (33.3 per cent) they were of the bovine type. Of the 81 cases, 37 were in children under 10 years of age, and, of these, 21, or 56.8 per cent, were caused by bovine bacilli. Of the remaining 44 cases (persons 10 years and over), only 6, or 13.6 per cent, were found to be bovine infections.—*Human and Bovine Infections in Bone and Joint tuberculosis, A. S. Griffith and G. J. Summers, Lancet, April 22, 1933, ccxxiv, 875.*—(*E. H. K.*)

Fusion of Tuberculous Hip-Joint.—Although early operation has been advocated by some, it has been the practice in this clinic to treat tuberculosis of the hip as a general disease. Rest in bed and reasonable protection of a diseased joint, together with supervised heliotherapy, are employed until the temperature curve has attained a rather fixed level. There may be some daily fever. General institutional treatment of the tuberculosis is necessary following operation. Biopsy has not been considered a routine necessity. In the earlier operations the graft between ilium and femur was obtained from the trochanter, but lately grafts have been obtained from the crest and side of the ilium. The success of the operation is dependent upon a massive graft across the joint space and firm engagement of the transplant into healthy bone, in the ilium above and the femur below. No effort has been made to do extraärticular fusions. A paraärticular fusion is attempted. One massive piece of cancellous bone should be used as a graft and placed in a thoroughly cleaned and scarified bed. Many small pieces of bone are used to fill all dead spaces. The hip is dressed with very little or no flexion at the time of operation. Graduated weight-bearing is allowed after three or four months if there are no contraindications. Some hips fail to fuse on the first effort. After a delay of a few months a second operation is necessary. This graft may be obtained from the tibia. Six of the 45 reported cases required a second operation. The average age was 7 years, and the youngest child was three. One death occurred the day of operation, presumably from pulmonary embolus. Meningitis was not a complication.—*Surgical Fusion of Tuberculous Hips in Children, O. L. Miller, Am. J. Surg., June, 1933, xx, 555.*—(*J. F. B.*)

Fusion of Tuberculous Hip-Joint without Cure.—The attitude has been taken that every tuberculous hip should be fused and that, once successful fusion has been accomplished, the infection is ended. It is felt by some that, unless destruction has actually taken place, more conservative measures should be employed. Young children should not be subjected to the operation. A child aged 11, in whom a successful fusion was accomplished by operation, after conservative treatment had failed, showed several interesting features. The diagnosis of tuberculosis of the hip was proved by examination of material from the operative field. Recovery was uneventful and the boy was perfectly well for two years. After this period he died of tuberculous meningitis and at autopsy it was found that, although bony fusion in the hip was evident, in the upper end of the femur and in the remnant of the neck there were several areas of active tuberculosis. This case is unusual and the final result does not detract from the value of the operation.—*Does a Successful Fusion of the Tuberculous Hip Cure the Tuberculous*

Process? C. F. Eikenbary and J. F. Lecoco, J. Bone & Joint Surg., April, 1933, xv, 502.—(J. F. B.)

Urogenital Tuberculosis.—In most cases of tuberculosis of the urinary system, the kidney is the primary seat of the disease. It is generally involved by haematogenous metastasis from a focus elsewhere in the body. The unilaterality and localization of the disease supports the embolic genesis. The lymphatic system seems to play a rôle only in the ascending secondary forms of renal tuberculosis and then, mainly, in spreading through the lymph-vessels in and around the wall of the ureter. Classification is from an anatomicoclinical point of view. Cases in which the disease is restricted to one kidney may, or may not, be manifest by pyuria and bacilluria. Chromocystoscopy with indigocarmine is the examination of choice. Ureteric catheterization followed by an instrumental pyelogram of the diseased kidney demonstrates the extension of the process. Excretion urography in this initial stage will usually not give much information. Cases in which the urinary ducts are affected will reveal on cystoscopy specific disease around the mouth of the ureter. Examination should proceed as in the previous class. Excretion urography may give valuable information as to the extent of the disease. Cases in which the disease is bilateral are examined by all of the above-cited procedures. The anatomical changes are so far advanced in these cases that excretion urography will permit an adequate morphological judgment of the case. Cases in which the male adnexa are infected can be diagnosed by direct inspection or palpation. The X-ray is essential in recognizing the surgical forms. In the treatment of renal tuberculosis, surgery remains the only solution. All conservative measures fail in the long run. Postoperatively methylene-blue, tuberculin, X-ray, and natural sunlight have proved useful.—*Guiding Principles in the Diagnosis, Treatment and Prognosis of Genito-Urinary Tuberculosis, A. Von Lichtenberg, Tubercle, July, 1933, xiv, 433.—(T. O. R.)*

Closed Renal Tuberculosis.—An engineer of 55 years was admitted to the hospital complaining of frequency of micturition, associated with a slight scalding pain. These symptoms were of eleven months' duration. There had been two attacks of haematuria in the three weeks prior to admission. Eight years previously he suffered from an attack of haematuria, which lasted several days, but was accompanied by no other symptoms. The only physical sign observed was some tenderness on palpating the right loin. A cloud of albumen was found in the urine and microscopical examination revealed pus and red blood cells. X-ray examination revealed stones in the upper pole of the right kidney. Intravenous pyelography done with uroselectan-B showed the left kidney to be normal, but the right one showed defective filling of the upper part of the pelvis in addition to shadows in the upper renal pole. The urea-concentration test revealed a slight impairment of renal function. The blood urea was 60 mgm. per 100 cc. At operation the findings suggested a tuberculous process and a nephrectomy was performed. Postoperative convalescence was uneventful. Macroscopic and microscopic examination of the kidney confirmed the diagnosis of tuberculosis. The bleeding, occurring without other symptoms, was regarded as presumptive evidence in favor of a tuberculous rather than calculous onset. Calcareous material is frequently noted in renal tuberculosis. The resistance of the kidney to the disease was demonstrated by the gross appearance, the mildness of the symptoms, the absence of tubercle bacilli in the urine, and the remarkable freedom of the ureter and bladder from obvious involvement.—*Closed Renal Tuberculosis with Special Reference to the Possibility of Healing in this Disease, A. L. O'Abreu, Brit. M. J., April 8, 1933, no. 3770, 605.—(T. O. R.)*

Intravenous Urography in Renal Tuberculosis.—The history of the development of intravenous urography is discussed briefly. Uroselectan B is the best contrast substance available, as it is nontoxic and may be obtained in a sterile, stable solution in 20-cc. ampoules. In preparation for the procedure, the patient is given a dose of castor oil the night before, and, at ten o'clock the next morning, after a light breakfast, 10 ounces of bovril are given. At eleven o'clock the bladder is emptied and immediately the 20 cc. of uroselectan B are injected slowly into a vein. This is the dose for an adult. Roentgenograms of the kidneys and ureters are made at intervals of five, ten, twenty and forty minutes after the injection. The patient may remain ambulatory after the injection. The only parts of the renal pelvis and the ureter delineated in any given roentgenogram are those that are in diastole, and as the dynamics are constantly changing, due to peristalsis, roentgenograms must be made in series. Jarre, by making four exposures per second with a Cinex camera, demonstrated the greatly varying dimensions of the outlines of the normal pelvis and ureter. Cumming noted certain regular activities of normal kidneys and ureters, such

as separate contractions of the calyces, infundibulum and pelvis without regular sequence; also segmental ureteric contractions in sequence from above downward. Jarre and Cumming observed a milking of the pyramids by the calyces, with a tendency to form a bulb at the ureteropelvic junction. The contrast substance is seen better in diseased than in normal kidneys, because secretion is more rapid in the latter. Thus the relative functional activities of the kidneys may be compared. Uroselectan B is secreted by the glomeruli only; thus the general outline of the kidney is often seen. It is estimated that 5 per cent of the substance in the urine can be visualized. Normally a good picture is obtained in five minutes, the maximum secretory rate is reached in two or three hours, and secretion is complete in ten hours after the injection. If the kidneys are healthy, the specific gravity of the urine reaches 1.050 or 1.060 during maximum secretion and falls to 1.030 at the end of secretion. No uroselectan B remains in the blood after four hours. The amount of uroselectan B secreted can be determined by drying after precipitation with one part of concentrated hydrochloric acid to four parts of urine. The drug tends to form gas in the colon, and this may obscure the kidney's outline, but no satisfactory means of preventing it has been developed. Abdominal compression to improve visualization is best avoided, unless the urinary system is hypertonic, because it distends the renal pelvis and inhibits the dynamics of the tract. Anatomical peculiarities of the calyces, pelvis and ureter are so frequent that it is difficult to diagnose early pathological changes. Stricture of the ureter may be simulated by systole of a normal ureter, but persistence of the picture is evidence of disease. In renal tuberculosis the secretory rate is retarded, and occasionally six hours must elapse before a dense enough pyelogram is obtained. Irregularity of the outline of the calyces and pelvis and dilatation of the uterer are seen, and, if the kidney substance is all destroyed, no urogram is obtained on that side. The shadow of the contrast substance is prominent around an abscess. Disease may delay completion of secretion to seventeen hours. Intravenous urography permits visualization of the anatomy and the dynamics of the urinary tract, while instrumental pyelography gives a picture of only the anatomy. The former method is preferable to the latter in renal tuberculosis, because it eliminates the pain of instrumentation, made severe by the frequently present cystitis; also, it avoids the danger of infecting the healthy kidney with a catheter and makes unnecessary the anaesthesia required for the cystoscopy of children. Further, it can be used in the case of patients too ill for cystoscopy. The secretion of uroselectan B in normal and tuberculous kidneys in four cases is illustrated by graphs.—*Intravenous Urography in the Diagnosis of Tuberculosis of the Kidney, E. H. A. Pask, Brit. J. Tuberc., July, 1933, xxvii, 112.*—(*R. M. F.*)

Addison's Disease.—This is a detailed study of 35 patients with Addison's disease due to bilateral tuberculosis of the adrenals and of 37 cases of unilateral and bilateral tuberculosis of the adrenals without Addison's disease. The chief thesis of this study is the statement that tuberculosis of the adrenals belongs to the group of haematogeneous tuberculosis. It is always secondary to a primary or postprimary focus, with the exception of the exceedingly rare cases of transplacental infection. In all cases of tuberculous Addison's disease haematogenous foci were found outside the adrenals, always in the pleura, and frequently in the urogenital system and in the skeleton. In more than one-third the cases, the adrenal foci were the only active tuberculous foci. When tuberculous changes were found in the lungs they always showed the characteristics of haematogenous propagation. No case was associated with progressive pulmonary tuberculosis. The average duration of Addison's disease due to tuberculosis is ½ to 2 years, the minimal duration being a few days, the maximal duration 10 years. The clinical manifestations of Addison's disease represent, however, only the brief terminal period after the adrenal tuberculosis has sufficiently advanced to produce symptoms of glandular insufficiency. It is difficult to determine the actual duration of the tuberculous infection in the adrenals, since this infection may exist without any noticeable symptoms. In comparing the adrenal and extraädrenal foci, provided only *one* spread has occurred, it is possible to determine the approximate duration of the whole disease. This was possible in 13 cases and, from these, the entire duration was estimated to have varied between 7 and 27 years. It seems that the tuberculous infection of the adrenals occurs during puberty and adolescence, while Addison's symptoms are most frequently manifest between the ages of 30 and 50. One encounters cases ranging from extreme acuteness to cases of pronounced chronicity. This study includes a discussion of most of the literature on the subject.—*Tuberkulöser Morbus Addison. Stellung der Nebennierentuberkulose im Ablauf der tuberkulösen Infektion, O. Gsell and E. Uehlinger, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii, 121.*—(*M. P.*)

Addison's Disease.—The present knowledge of the anatomy and physiology of the adrenal glands and the chromaffin tissues in general is reviewed. Comparative assays of the amount of cortical hormone in various parts of beef adrenals indicate that its concentration is relatively low in the outer part of the cortex and is higher as the medulla is approached. The greatest concentration is found in the extract made from the whole gland. To account for the greater concentration of the hormone in or near the medulla, it may be supposed either that it is stored in the larger venous sinuses, or that it is bound to some protein or other structure in the medulla, or that the cortex elaborates a precursor which is converted into the active substance in the medulla. The chief cause of Addison's disease is bilateral tuberculosis, which has about the same incidence as tuberculosis of the skin and usually is associated with tuberculosis elsewhere in the body. Tuberculosis attacks the medulla before it does the cortex, though the latter always is affected in cases of Addison's disease. In at least one-fifth of the published cases of Addison's disease the lesion found in the adrenals at necropsy is that of primary cortical atrophy, and the medulla is affected later. In 4 fatal cases of Addison's disease with primary cortical atrophy the destructive process was a progressive necrosis of cortical cells with collapse of the stroma accompanied by slight fibrosis. Peripheral regeneration of cells occurred in these cases and animal experimentation has shown that the response of residual cortical tissue to cortical deficiency is rapid. Duff found 4 less-advanced cases of adrenal atrophy without changes in the medulla or symptoms of Addison's disease. Pigmentation often is the first sign of Addison's disease, and in such cases the course is more prolonged and benign than in cases ushered in by asthenia and muscular weakness. Pigmentation may increase quickly during relapses, but disappears more sowly with improvement. Its relationship to the disease is not known. Thirteen patients with Addison's disease were treated with the new cortical extract during the past two and one-half years. Seven of these have died. The extract is valuable in the acute relapse and should be given early in large amounts. There is no danger of overdosage. The crisis is regarded as a condition of shock, analogous to the condition of insufficiency in the adrenalectomized dog after withdrawal of extract. Measures to combat shock should be used, especially glucose and salt solutions intravenously. The value of cortical extract during the intervals of comparative health is in doubt, though fewer relapses have occurred when extract was used. Prolongation of life has not been shown. The oral use of oil, preferably cotton-seed oil, enhances the effects of cortical extract in adrenalectomized dogs and apparently benefits patients with Addison's disease. Sodium chloride should be allowed freely. It is believed that Addison's disease is dependent upon disturbed function of both the cortex and the medulla, which have reciprocal relations such that damage to the one produces disturbance in the other.—*Addison's Disease and Its Relation to Experimental Adrenal Insufficiency, G. E. Harrop, Ann. Int. Med., June, 1933, vi, 1579.*—(*R. M. F.*)

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